STATE OF INDIANA)
) SS:
COUNTY OF DELAWARE)

IN THE DELAWARE COUNTY SUPERIOR COURT

CRAIG DUNN and PHILIP WILEY, et al.,)
Plaintiffs,)
)
-v-) CAUSE NO.
) 18D01-9305-CT-06
RJR NABISCO HOLDINGS CORPORATIONS, et al.,)
Defendants.)

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MR. CASSELL: All rise.
THE COURT: Be seated.
Good morning, ladies and gentlemen.
ALL: Good morning.
THE COURT: Good morning, Counsel.
ALL: Good morning, Your Honor.
THE COURT: We're on the testimony of Dr. Townsend. Is Dr. Townsend here?
MR. WAGNER: Yes, he is, Your Honor.
THE COURT: Good morning. Would you raise your right hand again.
DEFENDANTS' WITNESS, DAVID TOWNSEND, SWORN
THE COURT: Have a seat again, please.
MR. WAGNER: May I proceed, Your Honor?
THE COURT: Would you tell the jury your name.
THE WITNESS: Yes. My name is David Townsend.
THE COURT: Mr. Wagner.
MR. WAGNER: Thank you, Your Honor.
DIRECT EXAMINATION,
BY MR. WAGNER:

Q Good morning, Dr. Townsend.
A Good morning.
Q Just to sort of set the stage a little bit, yesterday you had described the health claims about cigarette smoking that were made starting in the 1950s; right?
A I did, briefly.

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Q And then the '50s, the scientific community began to study cigarettes and cigarette smoking?
A That's correct.
Q And the smoking and health issues that were raised about cigarettes and cigarette smoking came in large part from the scientific community; correct?
A That's my opinion, certainly.
Q And the issues that were raised about cigarettes and cigarette smoking by the scientific community and others were part of the reasons why cigarette manufacturers like Reynolds and designers like yourself addressed those issues and claims; right?
A Yes, sir.
Q Okay. And in your work designing cigarettes at Reynolds, you take into account the

scientific work done in the past and the views of the scientific community; is that correct?
A We did.
Q Okay. I think yesterday you had told us that the two major approaches that Reynolds and the other cigarette companies took to respond to consumer demand for lower tar in cigarettes and the scientific criticisms about cigarettes were selective reduction and general reduction; right?
A That's correct. Selective reduction and general reduction.
Q And I think when we concluded for the day yesterday, you had described the application of selective reduction techniques to reduce or eliminate benzo(a)pyrene; right?
A That's correct, that was one example we considered yesterday.
Q And there came a time, I believe you testified, when questions were raised by tobacco scientists about benzo(a)pyrene as a compound in cigarettes that could account for the results of the mouse skin painting tests; right?

A That's correct.
Q And will you step down with the Court's permission, please, and if you can, use some demonstrative charts to illustrate what those questions were.
A If you'll recall, yesterday we talked about attempts to reduce benzpyrene and, of course, that included three elements at Reynolds. First, identifying benzpyrene in smoke, making sure it's there. Also determining the level of benzpyrene in smoke and. Then thirdly, trying to seek ways to reduce or eliminate.
As that research was going on through the '50s, I've already said that Reynolds sought ways to reduce benzpyrene through a

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variety of techniques; extraction seemed to technically work. We even built pilot plants to try to process tobacco to reduce benzpyrene.

And at that period in time, the scientific community began questioning, because we now knew how much benzpyrene was present in cigarette smoke, the scientific community began questioning whether there

was enough benzpyrene to account for the mouse skin painting data.

And this is a quote, again, from Professor Wynder who did the original mouse skin painting in the early '50s. And he said, and this is taken from the British medical journal. "Benzpyrene content of cigarette tar is not much more than two parts per million, which according to our experiments is not sufficient to produce the type of activity noted in our animals painted with tobacco tar."

Q And then is there another demonstrative chart that you have that bears on this issue?

A Yes, sir. This is from Dr. Coulston, who I believe was at the American Cancer Society. And he said in this paper "More work has been done on benzpyrene to prove it to be the causative agent in cigarette smoking than I think on any other chemical for any other disease that I know of, and yet the point is you can't prove it." This is taken from the report of 1980.

Q Okay. Now, as the benzo(a)pyrene hypothesis

lost emphasis, was there another theory that came along?

A I think the benzpyrene theory did lose emphasis. That's not to say that the door was shut on that as an issue. But there was another theory, and it was that -- well, if there is not enough benzpyrene, then maybe there are compounds in smoke that together with benzpyrene could be a promotor to promote the activity.

Q What was that?

A Well, there were a class of compounds, particularly phenols, that were thought to be promoters in cigarette smoke.

Q Can you tell us what phenols are?

A Phenols generally are a class of compounds that includes a six-member aromatic ring, or maybe even multiple six-member aromatic rings, and have hydroxyl functions or OHs hanging off the side.

Q Are they unique to tobacco smoke?

A No, they're not. They are found in many natural products, including tea. Some polyphenols are found in green tea, are thought to be beneficial even. Phenols are

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found in many consumer products, including Chloraseptic and throat lozenges and the sort.

Q So what did Reynolds do in response to the phenol theory?

A We took the same approach as we did with benzpyrene, three major elements: We sought to identify phenols and polyphenols in cigarette smoke. We sought to determine how much was present in cigarette smoke, and then we sought ways to reduce or eliminate those compounds.

Q And were phenols found to be present in tobacco smoke?

A They were, a number of phenols.

Q And at what levels?

A Some of the phenols, particularly the more volatile phenols are found in cigarette smoke at the microgram level, and some of the polyphenols are found at much smaller levels, again in the nanogram quantity.

Q What kind of techniques did Reynolds use to eliminate or reduce phenols?

A We looked at many of the same techniques that we looked at for benzpyrene; filter

additives, different filter materials, tobacco processing to try to remove the precursors. We did basic experiments to try to understand what precursors may be responsible for the production of phenols. We found that lignin, for example, which is one of the backbones of tobacco, was one of the precursors, so we tried to extract those precursors. We also tried tobacco additives as well.

Q Did any of those techniques meet with success?

A Some did. Particularly for the more volatile phenols. I would say that the more volatile phenols were selectively removed by cellulose acetate filters, first of all. And also we found that the compound that was put on the filter to make it firm, that's called a plasticizer, and RJ Reynolds has used triacetin, also selected to remove some of the more volatile phenols, some of the less volatile phenols were not selectively removed by those.

Q That triacetin, is that the correct pronunciation?

A Triacetin.

Q Was that used then by Reynolds?

A It was in place by Reynolds actually about the time we were doing that work.

Q Were there any filter materials that proved successful in eliminating phenols?

A Well, cellulose acetate, which I've already

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described is the material that we make the filter fibers out of, was a selective agent for removing the more volatile phenols.

Q And was Reynolds Tobacco the only cigarette manufacturer to discover a way to reduce phenols?

A No. I think there were other plasticizers and filter additives examined. For example, I think one of our competitors, Brown & Williamson, looked at carbowax for selective removal of phenols and found it can selectively remove, again, the more volatile phenols, not the less volatile phenols.

Q How did the tobacco scientific community react to selective reduction in phenols that were achieved by the filter additives?

A Well, I think by the time that work had gone on, the scientific community had begun

looking at other possible constituents in smoke that may account for the epidemiology.

Q And do you have a chart that would illustrate those views?

A Yes. Again, there was a lot of question about whether phenol was a promoter for benzpyrene activity. There was some question about phenol in itself possibly being a problem, and there was also some questions about whether phenols could inhibit tumorigenicity.

This is an example from the National Cancer Institute journal. This is a quote by Van Duuren, Dr. Van Duuren. He said, "We've also found that phenol, which is a weak tumor promoting agent, is indeed an inhibitor of tumorigenicity when applied simultaneously with BaP." Which is benzo(a)pyrene.

So there was a lot of question about its promoting ability versus its inhibiting ability. In my view of the literature is that scientists then began looking at other possible reasons why cigarette smoking is related statistically to disease.

Q All right. Let's talk in just a little bit more detail about one more. What was the next predominant theory that came along after phenols that was focused upon?

A The next predominant theory after phenols, and again, the door wasn't shut on phenols, nor benzo(a)pyrene, but scientists began looking at classes of compounds that might be ciliastasis was the next theory.

Q Can you explain what ciliastasis is?

A Ciliastasis -- let me back up. In the upper respiratory tract, there are small hair-like projections called cilia. And they're important to the lung clearance mechanism because they beat in unison to try to move material up the respiratory tract into the

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esophagus where the air is swallowed. It's thought, the ciliastasis theory is based on the suspicion that there is some compounds in smoke that may inhibit or stop the action of these cilia. So it essentially gets in the way of the clearance mechanism.

Q Okay. And are those kind of compounds unique to cigarette smoke?

A Well, no, they're not. There are many

ciliastats present in air pollution, a number of things that we breathe.

Q Are they present in sherry and ripe fruit, for example?

A Those are some examples.

Q And what was Reynolds' response to the cilia stasis theory?

A Again, we sought to determine what compounds in smoke might be ciliastats. We determined there are a number, and different classes; aldehydes, ketones, nitric oxide was thought to be a cilia stat. Then we thought to identify their presence in smoke, to determine the levels of these constituents in smoke, and seek ways to reduce them.

Q And they were found to be present in smoke; is that right?

A A number of constituents at low levels were found to be present in smoke that were thought to be ciliastats.

Q When you say low levels, at what levels?

A Some of the ciliastats, particularly the aldehydes, are present in the microgram quantity. So that's a millionth of a gram.

Q And what techniques did Reynolds use to

eliminate ciliastats?

A One of the major techniques we looked at was through alternate filter materials and through filter additives. We also did look at tobacco processing, like trying, again, to extract precursors out. But most of the focus, I would say, was on unique filters and unique filter additives.

Q And did you use a carbon filter?

A Carbon filter was actually the one that received probably the most attention, actually.

Q And did Reynolds actually develop and market a cigarette that used a carbon filter?

A We did. And I think all of our -- each of our competitors had at least one product in the market at the time that used carbon filters in an attempt to reduce ciliastats in smoke.

Q And how did the smoking public react to the use of carbon-filtered cigarettes?

A Well, initially there was interest in it. I think about the same time there was a Reader's Digest article that peeked consumers' interest in carbon-filtered

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cigarettes. Let me go back and make it clear, this was in the early '60s.

So there was a lot of initial trial among consumers of carbon-filtered cigarettes. I think there were some taste questions about it. Many consumers found carbon-filtered cigarettes to taste different and, therefore, over the long-term, they didn't accept those products.

Q And do you have a chart there that illustrates what happened to charcoal-filtered cigarettes in the marketplace?

A What this is is a chart showing carbon filters in the U.S. market. Beginning in the early '60s with the first introduction in Lark, which was made by one of our competitors, in fact, received the lion share of the business of carbon-filtered cigarettes. But you can see a rapid rise in the early '60s for Lark. In 1964 RJ Reynolds introduced Tempo, which had a carbon-filtered cigarette. Again, a sharp increase in share of market or sales. But a

pretty gradual decline over the next number of years.

We believe that this gradual decline is a direct result of the very different taste characteristics in carbon-filtered cigarettes. For some reason, U.S. smokers don't prefer that taste.

Q Tempo was the Reynolds product; is that right?

A Tempo was the Reynolds product, that was the smaller product here. Lark was one of my competitors.

Q And what eventually happened to Tempo?

A We actually took it off the market in say the early 1980s. I can't recall an exact date.

Q And to a cigarette designer like yourself, is there a lesson here that can be learned from this?

A I think the primary lesson is that we can make changes to cigarettes that can change the chemistry and the essential piece of this is that it must be consumer acceptable to stay in the market.

Q Doctor, after the cilia stasis theory, were

there other theories that were advanced about smoking and health claims?

A There have been a number, or a series of theories that have been advanced along the same time or even after, including Polonium 210, nitrosamines, tobacco-specific nitrosamines. There have been a variety of

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theories that the scientific community has looked at.

Q And what did Reynolds and the other cigarette companies do to address those theories?

A Well, in every case, we looked at each theory very carefully. We took those theories and tried to investigate them, tried to understand the basis of the theory, whether we believed it or not, or tried to seek ways to reduce or eliminate the compounds that were the essence of these theories.

Q Has there ever been a time when there was a sustained scientific consensus that precisely what, if anything, ought to be selectively removed from cigarettes?

A I don't believe that there has ever been a

sustained consensus in the scientific community about what in cigarette smoke needs to be reduced or eliminated.

Q And do you have a chart that would illustrate your testimony in that respect, Dr. Townsend?

A Yes. What this is -- this chart represents three excerpts that speak to the moving target; the fact that there hasn't been a consistent or a consensus among the scientific community.

The first, Peto and Doll in the British Journal of Cancer, and Doll was an epidemiologist who developed some of the early associations between cigarette smoking and disease. He said that "It's not known which chemicals in tobacco smoke are responsible for its carcinogenic effect." That's in 1986.

"This complexity --" I'm sorry. This is taken out of IARC, the International Agency for Research on Cancer. And their opinion is "This complexity of tobacco smoke has made it difficult to identify any individual agent within tobacco smoke as the

chief cause of the diseases that are caused by smoking."

And then over here, the Banbury report, and that's in 1980. "However, understanding the components which may act on the cardiovascular and respiratory systems is embarrassingly lacking if not outright contradictory. Uncertainty about the specific attribution of risk to the individual smoke components may be greater than ever now." And that's in 1980.

Q Okay. Dr. Townsend, I think we're about to finish up with discussing selective reduction. Do you have a chart that would illustrate for us the problems, and sum up the problems with selective reductions?

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A I will, and this is quite general. It represents quite a lot of work that Reynolds and other tobacco companies have conducted. Overall, I believe that there are significant problems that we faced with selective reduction. We've had marginal success, frankly, and only marginal success up to date, because it's technically difficult to go into a complex mixture like

cigarette smoke and selectively remove one compound or even one class of compounds from smoke.

The second problem with selective reduction is the moving target experience. The scientific community can't agree or hasn't agreed on what in cigarette smoke may be the problem. So we're constantly trying to hit a moving target.

Another problem is strangers. Many of the techniques that we've looked at to try to effect a selective reduction, in fact, adds new compounds to the smoke. We call those smoke strangers. And some of the techniques that we've used have unintended consequences.

And what I mean by that is, let me step all the way back to our extraction work with benzo(a)pyrene. We found that if you extracted tobacco to try to reduce benzo(a)pyrene, that happened. But phenols, phenol level went up as a result of that extraction. So there is an unintended consequence that we didn't know what the net result of that might mean in terms of

cigarette smoking and health.

And then finally, one of the biggest problems is taste. As we've used alternate filter materials, as we've used processed tobaccos, extracted tobaccos, we really changed the taste character of the smoke and we've found those to be unacceptable in the marketplace.

Q But just to make it clear, and I think you've already said this, Reynolds and the other tobacco companies have not ceased their efforts to use selective reduction to remove compounds like benzo(a)pyrene and others; right?

A We continue to do selective research, selective reduction research even today. Even as we speak, scientists are doing that.

Q Now I think you already mentioned that Reynolds then began, or I guess, simultaneously, really, was working on a broader approach for removing constituents from cigarettes. And why was that?

A Well, I think the other approach, the general reduction, is really an approach where if we have these problems with

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selective reduction, particularly the moving target experience, we don't know what compound for sure ought to be removed, then a good approach would be to reduce all compounds, more or less the same. That's the general reduction theory.

Q And when did Reynolds begin to do research on general reduction?

A In the early '50s about the same time we began selective reduction.

Q And were the other tobacco companies, to your knowledge, also engaging in general reduction?

A To the best of my understanding, they were, indeed. We see that from the literature, the patent literature, scientific presentations and so forth.

Q And what's your understanding of the reaction of the tobacco scientific community to the general reduction approach?

A I think, in general, the scientific community, in my opinion, embraced general reduction as a viable direction to go.

Q And Dr. Wynder, who you mentioned earlier, did he have a view?

A Well, he did. He had, I believe, a very strong view.

Q And did he advocate, in fact, a percentage reduction?

A He did. In 1957, I believe it was, there was an article in the Reader's Digest where Professor Wynder suggested that if one is able to reduce the total tar yield of the cigarette by 40 percent, that that would be a significant step toward reducing lung cancer.

Tar yields in 1957 averaged about 30. So you see they had come down from 38 or so down to about 30. So 40 percent reduction of 30 milligrams per cigarette would be about -- would give us a cigarette of about 18 milligrams per cigarette.

Q Doctor, do you have a chart that would illustrate for the jury the advantages of general reductions?

A Yes. What I have here is four major advantages of general reduction. First of all, it's technically practical. We can, and have done it in the marketplace.

Second, it addresses all target

compounds. It gets around them, around the moving target problem that we face because we're reducing all the compounds in cigarette smoke, more or less, to the same degree. There's no strangers, no smoke strangers. There is no unintended consequences. Everything is coming down.

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Nothing is going back up. And very importantly, it doesn't change the character of the taste. If we go through general reduction, the intensity of the taste, the strength of the taste is less. No question about it. But the overall balance or character of the taste is really quite similar.

Q Let's talk a little bit more specifically now about general reduction. Do you have a chart that would illustrate the techniques involved in general reduction?

A Yes.

Q And these are techniques that have been utilized since about the 1950s or so; is that right?

A Work began in the early '50s, and I think has progressed over time up to today.

Q Okay, if you would, please, explain to the jury.

A These are some of the major techniques that RJ Reynolds and its competitors have used to effect the general reduction. The first, and this is probably pretty obvious, is the use of filters. Filters remove particulate materials, these little droplets, and reduce the tar and nicotine delivery.

We've also used reconstituted tobacco. Reconstituted tobacco is essentially a process where we take small pieces of tobacco that are too small to use in cigarette manufacture and we make larger pieces so that we can use those in cigarette manufacture. And one of the overall consequences of reconstituted tobacco is the reduction in tar.

We've also invented and refined use of expanded tobacco. Expanded tobacco, we'll talk a little bit more about, but essentially expanded tobacco fills, actually occupies a larger volume so you can reduce the tobacco weight or the amount of tobacco burned.

We've also altered cigarette dimensions, going to smaller circumference or smaller diameter. And also smaller -- shorter lengths. We've also used filter dilution or filter ventilation. More porous papers and faster burning cigarette papers.

Q Were each of these techniques successful in bringing about a general reduction in compounds in cigarettes?

A Each of these techniques contributes to the general reduction, some of them in a major way, some of them somewhat lesser, but put all together there's an interactive effect or synergistic effect to give a major reduction in tar and nicotine yields.

Q Let's talk about filters there for just a

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moment, which is the first item on your board. Why are filters an effective general reduction technique?

A First of all, and again this is probably pretty obvious, filter, fiber filters, can remove these little droplets or particles that are in smoke, so it's a mechanical removal process.

Q Do you have a chart that would help the jury

to understand how a filter works?

A This is -- let me explain what this is. We've done a lot of research on filters and how filters work and how filters remove particles. What I've got here is a cross-section of one fiber. And just for purposes of illustration, this happens to be a round fiber. In the industry, and at Reynolds, we don't use round fibers, but this keeps it's simple.

So we've got a cross-section of a round fiber and then we've got smoke flowing through the filter in this direction. And what I've tried to indicate is streamlines of the smoke that's going around the fiber.

Now, what happens when smoke particles flow around that fiber is that there is three major mechanisms that a fiber filter will remove particles. The first is called inertial impaction. Essentially what that means is the particles moving along through the smoke stream here, and as the smoke goes around the side, this particle breaks away from the smoke stream and collides with the front edge of the fiber. That's pretty easy

to see. We call that impaction.

A second mechanism is where the smoke particle follows the smoke stream around the fiber but, as it goes around the fiber, it touches, so it's close enough to the fiber it just touches and it sticks. We call that interception.

The third major mechanism how filters work is when the fiber -- I'm sorry, the fiber. The particle that follows a streamline that's pretty far removed from the fiber surface but, as it's going around, this particle doesn't stay still and moving straight in one direction. It's always moving around from side to side and maybe even backwards. We call that diffusion, or Brownian diffusion. And if a particle is small enough, it can actually sidestep into the fiber and touch and stick. So these are the three major mechanisms of fiber filtration.

Q Are there different designs of filters?

A There are different designs of filters.

Q Do you have a chart that would help illustrate the different designs of filters?

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A What this chart shows, first of all, is a fiber -- a fiber filter. And of course, the fiber filter is designed to collect these little particles, these little droplets, so I've described or shown these particles on the surface of the fiber.

We found that, through filter modifications, we can greatly increase the removal of tar and these tar particles by using different filter materials. We've looked at cellulose acetate paper filters, a variety of others. I've said we don't generally use round fibers, we use either Y-shaped cross-section fibers or I beam cross-section fibers; and the reason there is to increase the surface area of the fiber to make it more efficient in removing the particles.

We can also change the density of the filter, that is, pack more fibers in the filter. We can also increase the filter length. And then there are also unusual shaped filters to try to increase the filter efficiency.

Q Is there any limit to how much tar you can

actually filter out of a cigarette by using filters?

A Well, technically there is no limit. We can design filters that remove virtually all the particles and remove all of the tar.

Q Is there some --

A Practically there is a limit. But those products aren't consumer acceptable.

Q And why is that?

A Well, I think there is two reasons. If we get -- if we go to no tar, there is no taste. Also, if we go to very efficient filters to remove all the particles, the pressure drop, you know, how hard or how hard it is to draw on these cigarettes become so high that they are also consumer unacceptable.

Q What do you mean by pressure drop? Could you give us an example of what that would be.

A Pressure drop is a term we use within Reynolds, and I think some of my competitors use it as well, but it's essentially a measure of how hard it is to draw on a cigarette. A higher pressure drop would be

more difficult to actually draw air and smoke through, a lot like drawing a milk shake through a straw or water through a straw. Those are two different pressure drops.

Q Another of the general reduction techniques that were on your chart that you talked

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about was reconstituted tobacco; is that right?

A That's correct.

Q Do you have a chart that would tell us about that?

A Let me back up and say that this represents a tobacco leaf. We've got a mid rib and we've got stems that come out from that mid rib. One of the first things that a tobacco company does is puts this leaf through a process where we try to cut out the leafy portion, what we call lamina, separate the stems from the leafy portion and separate out the mid rib. The mid rib is generally thrown away. The stems and lamina, or leafy portion, is kept.

But in the process of doing all this separation you get some big pieces of

lamina, you get some small pieces of lamina. The small pieces of lamina and the stems are not suitable to go through a cigarette maker and actually make the tobacco rod.

So what we developed, and RJ Reynolds invented the first process, some of our competitors have invented other processes as well later on; but what we invented was a process where we took these small pieces that we couldn't use and some of the stems and some tobacco dust that's generated in this stemming operation, and actually make a paper sheet which then we could cut into the right size piece and put into the blend.

Now, to make the paper sheet, one uses a lot of water. Any paper sheet manufacturer uses a lot of water to lay down the fibers and make the paper. So that -- a large amount of water would actually pull out a lot of tobacco flavoring materials in nicotine.

So what we did was, we would first then put these materials into a centrifuge, add water, which would then take out all the materials that were water soluble. We then

held that to the side, go ahead and take what remains, and make a paper sheet. And then take these water soluble materials and spray back on to the sheet after it's formed.

Okay? So that's generally the reconstitution process.

Q Then how is it that reconstituted tobacco reduces tar?

A One of the primary reasons is because these stems that we use generate considerably less tar when they're burned.

Q Does reconstituted tobacco also reduce nicotine?

A It does reduce nicotine. In fact, reconstituted tobacco has a substantially

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lower nicotine level than the leafy portion of either flue-cured or burley. And part of the reason is because -- or a large part of the reason is because the stems have a very low nicotine content.

Q How long has Reynolds been using reconstituted tobacco in its products?

A We actually invented this process in the late '40s. Its first commercial use was in

1954 when we introduced Winston.

Q Do the other U.S. tobacco companies also use reconstituted tobacco in their products?

A All U.S. tobacco companies use reconstitution of one form or another. They don't necessarily use exactly the same process, but they do make reconstituted tobacco.

Q And is it fair to say the reconstituted tobacco and its use in cigarette products is well publicized and well known?

A Well, it has been well known. There are many, many patents in the literature about the variety of different reconstitution processes.

I think this has been described to Congress back in the '50s by the CEO of RJ Reynolds, for example. It's also been in a variety of public documents like Reader's Digest and other places. It's no secret.

Q I think another one of the general reduction techniques that was on your board there a while ago was the use of less tobacco and expanded tobacco; is that right?

A That's correct.

Q Can you explain what those are to us, please.

A Obviously, if you want to reduce tar and nicotine yields, one way to do it is to burn less tobacco. It seems obvious. And one way to do that is to change the dimensions of the cigarette, make shorter tobacco rods, make smaller diameter tobacco rods.

But in the '60s, RJ Reynolds invented another process called expansion. And the intent behind the expansion process was to swell the tobacco, kind of like popping popcorn, you make it bigger, so that it occupies a larger volume so you can reduce the weight of tobacco in each cigarette and, consequently, burn less tobacco, generate less tar and nicotine.

Q And is that what's called expanded tobacco?

A That is expanded tobacco.

Q Do you have a couple of samples here that you could use to show the jury what expanded tobacco is?

A Yes. What I have is two samples.

THE WITNESS: May I, Your Honor?

A What I have is two samples. The first is

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unexpanded tobacco, the second is expanded tobacco. And the weight of tobacco in these two jars is the same. So you'll see that the expanded tobacco fills a larger volume. Obviously, we can use this to reduce the tobacco weight and reduce the total amount of tobacco content.

Q While the jury is examining those, Doctor, let me ask you, maybe you did cover this. Does expanded tobacco contribute to a general reduction of tar yields?

A Expanded tobacco does contribute in a great way to general reduction of tar and nicotine.

Q Is there a limit to the amount of expanded tobacco that you could use in a cigarette?

A Well, technically there is no limit. We could make a cigarette of 100 percent expanded tobacco. From a practical point of view, though, we can't, because those products are unacceptable to consumers.

Q Does Reynolds incorporate and use expanded tobacco in its commercial brands?

A We do.

Q And to what extent?

A I believe all of our products in the commercial market have some expanded tobacco in them. The level varies. The low tar and ultra low tar, especially the ultra low tar products use more expanded tobacco. The higher tar products use less, but they all include some expanded tobacco.

Q And what about Reynolds' competitors, the other cigarette companies; do they also use expanded tobacco in their products?

A They do. Now, RJ Reynolds invented the first expansion process in the middle '60s, but our competitors have developed their own processes or licensed our process. And I believe that all of our competitors use it. It's widespread throughout the market.

Q Let's talk about the next general reduction technique which I think is air dilution; is that right?

A That's correct.

Q And do you have a chart that would illustrate what air dilution is?

A Yes. Now, air dilution is one of the major techniques also for tar and nicotine reduction. There are two types of air

dilution: Filter air dilution, or ventilation, and paper air dilution or ventilation. Let me talk about this one.

The filter ventilation, essentially what the -- what a cigarette manufacturer will do is place holes or vents in the filter of the cigarette, roughly here, so

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that when a smoker draws on the mouth end of a cigarette, the portion of what goes in their mouth is fresh air that comes through these vents.

Also, because a portion of what goes in the smoker's mouth is air from the outside, what that does is reduces the effective puff size, or puff volume, up here at the burning end and so one generates less tar and nicotine as a result of that. So two major effects: Fresh air being drawn in and reduced tar production, because there are holes here.

The second technique is increased paper porosity. As the smoker -- if one increases the permeability of the paper, makes it more easy for air to flow through the paper, when the smoker draws on the mouth end of the

cigarette, a larger proportion of air will be drawn all along the tobacco column, again, diluting the smoke and, to a degree, to a smaller degree, reducing the amount of tobacco -- the amount of tar generated.

Q You talked a little bit ago about pressure drop, the difficulty of puffing on cigarettes. Does filter ventilation and paper porosity affect the pressure drop problem?

A Well, it does affect pressure drop to a great degree. Obviously, if I put vents or holes in the filter, it's easy for air to come through here so it will actually reduce the pressure drop of a cigarette.

The other thing that happens when I put vents here or air dilution holes here, is the smoke moves a little bit slower up to this point where the holes are, and actually increases the filter efficiency of this segment of filter upstream of where those vents are because we find that filter efficiency, the removal of particles by the filter, is very flow dependent. The slower the smoke flows, the more efficient it is.

So filter ventilation and the filter itself have an interactive effect where you get a much greater increase or much larger removal of smoke.

Q Was Reynolds the first company to experiment with air diluted filters?

A No, we weren't the first company. However, in the early '70s, we did take the idea and perfect it for our use. We tried to understand exactly how air dilution works, how it affects the generation of tar, the overall pressure drop characteristics, the filter efficiency changes, so we did a lot of basic research and implemented it in the marketplace, but we weren't the first.

Q I think the first, really, was American

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Tobacco Company; is that right?
A American Tobacco Company commercialized the first air diluted cigarette, and I believe it was roughly the late 1960s.
Q All right, Dr. Townsend. I think the last of the general reduction techniques that you had on your chart was faster burning cigarette paper; right?
A That's correct.

Q And can you tell us about that?
A Faster burning cigarette paper may make sense for tar and nicotine reduction because if the cigarette paper will burn faster, it allows more air to get into the combustion region, the fire cone, or the burning end, will burn faster, so then the smoker gets fewer puffs. I think that kind of makes sense. The fewer puffs, the less tar and less nicotine delivery to the smoker.
Q And what in particular has Reynolds had to do to incorporate faster burning papers into its cigarette products? Do you have to work with paper suppliers and that sort of thing in order to do that?
A We have ongoing relationships with a variety of cigarette paper suppliers from around the world. Including two major one here in the United States.
Q And, again, is Reynolds the only company that utilizes fast burning papers?
A No. All the tobacco companies in the United States use faster burning cigarette paper.
Q Dr. Townsend, can you illustrate for the jury how these general reduction techniques

that we've been discussing have been incorporated into Reynolds' Winston brand cigarette to reduce tar and nicotine over time?
A Yes. What I have here is a chart, tar and nicotine. The tar is the red curve, the nicotine yield is the blue curve. These are data for Winston full-flavor cigarette. Now, Winston was introduced first in 1954, became the first successful filtered cigarette in the United States.

In 1954 Winston delivered about 38 milligrams per cigarette tar. And over the years, with the introduction of faster burning papers, longer filters, more efficient filters, more porous papers that we've already talked about, reduced circumference, the use of expanded tobacco, air dilution had a significant drop here, you see there has been a major reduction in the overall tar yield from Winston over this period of time.

The nicotine yield, we'll see, pretty much parallels it. Not exactly, but it's real close and it parallels it quite well.

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The overall result is if we compare this cigarette in 1954, which had a tobacco weight of one gram, to the cigarette at the end of this chart, the tobacco weight was .77 grams. There's been a major reduction in weight. There's been a major reduction in tar because of the other tools that we've used.

Q And tell the jury what the effect of the general reduction techniques have been on benzo(a)pyrene that we talked about earlier.

A Well, in general, benzpyrene is present -- well, benzpyrene is present in the particulates, or these little droplets. It's not volatile. And as one reduces the tar, one reduces the benzo(a)pyrene pretty much to the same degree that the tar is reduced.

For example, in 1956 or thereabouts, the benzo(a)pyrene level in Winston was about 50 or 52 nanograms per cigarette. 52 billionth of a gram.

Today, or out here, around -- in the 1990s, it's down around 10 nanograms per cigarette or slightly under.

Q We've been talking about cigarettes with filters. Can you do general reduction with non-filtered cigarettes and have a substantial effect, too, on compounds?

A You can use some general reduction tools for non-filtered cigarettes.

Q And do you have a chart that would illustrate that point for us?

A Yes. This is a similar chart of tar and nicotine yields for Camel non-filter over the time period from 1954 to 1986. Again, you'll notice that in 1954 the tar yield from Camel non-filter was about 38 milligrams per cigarette.

Through the use of reduced circumference, more porous papers, expanded tobacco, increased paper porosity, we see a reduction from that 38 milligrams per cigarette down to about 20 milligrams per cigarette. Not as great as for Winston, but it is still a major reduction in both tar and nicotine.

Q In addition to Winston and Camel that we've been talking about, has Reynolds introduced in the marketplace other low yield brands

too?

A Reynolds has introduced a large number of low yield or lower tar products, both low tar and ultra low tar products, like Vantage. We had one of the first successful low-tar products in, right around 1970. We've also had line extensions of Camel and

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Winston, so now there's a full range of products, for example, Winston Lights, Winston Ultra Lights, Camel Lights, Camel Ultra Lights, and then, of course, Reynolds markets a product called Now, which is extremely low-tar yield, about one milligram per cigarette or less.

Q Why is it that all the brands of cigarettes don't incorporate these techniques to reduce tar to the maximum extent possible?

A Well, of course, technically, that's possible, but what we find is that consumers want a range of products. Some consumers want a higher-tar product, some consumers want the extremely low-tar products. Consumers want that range, so we provide that range to smokers.

Q And do you have a chart that shows the range

of tar levels in products offered by Reynolds?

A Yes, I do. What this chart shows is the highest and the lowest tar-yielding products sold by RJ Reynolds for any -- for a given year, beginning in 1955, and continuing up to about 1985.

And you'll notice that in 1955 the highest tar product is about 50 milligrams per cigarette, real high tar. The lowest product was about 38. We've already talked about. Today -- or in 1985, you'll notice that the range is much broader. The range of tar yields that we provide the smokers is much broader than it used to be, and also the highest tar product we sell today is substantially lower than the lowest tar product we used to sell. So the range has come down, and the range is broader.

Q Do you have another chart that shows the general reduction of tar and nicotine with respect to all cigarettes sold in the United States over the last 40 years?

A Yes, I do. What we've talked about so far is for the tar yield for specific brands or

even the tar yields for RJ Reynolds. What this is is the tar and nicotine yields for the entire industry in the United States based on sales. So it's a sales weighted average.

Beginning in 1954, the sales weighted average was somewhere around 36 to 38 milligrams, in that neighborhood. And then, as we've incorporated these general reduction techniques, the sales weighted average has declined to around 12 milligrams today. Today the average cigarette sold in the United States is 12 milligrams of tar.

Nicotine, as you can see, has roughly paralleled that same decline. This result -- this overall reduction in tar and

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nicotine is on the order of -- it's more than 60 percent reduction.

Q When you talk about sales weighted averages, what is that term?

A Well, it's the average tar level sold in this country above which half the cigarettes are higher, half the cigarettes are lower.

Q And what does that tell us about the kind of products that people are smoking today?

A Well, overall today, smokers are smoking lower tar products than they used to.

Q And once again, was technology the only thing that accounted for the fact that tar and nicotine yields have been reduced over the years?

A Well, the technology was certainly important to accomplish what we've done here. The technology was critical to yielding lower tar products. But consumer acceptance of those product was also critical for those products to be in the marketplace.

Q In your opinion, if you hadn't had consumer acceptance for those kind of products, where would the tar and nicotine yields be?

A If consumers hadn't accepted the lower tar products as we had tried to do this, we would still be back here in the higher tar products.

Q I think on that chart it shows that the tar and nicotine yield has flattened out; is that right?

A Out here, in recent years, it appears that the tar and nicotine levels have flattened out. And if we extended this chart from '86

to today, we would see a little bouncing around, but pretty much flat.

Q And why is that?

A Well, I think consumers for a variety of reasons are not continuing to trade down to the lowest products. They find those of limited consumer acceptance, and so they're not continuing to trade down to the same degree they used to.

Q I think you told us earlier that in 1957, I believe it was, that Dr. Wynder had called for a 40 percent reduction in tar to reduce the risk of cancer from smoking; is that correct?

A That's correct.

Q And how do these cigarettes respond to that?

A Well, again, if you remember, in 1957, Wynder suggested that a 40 percent reduction would significantly reduce lung cancer. And that would translate to an 18-milligram per cigarette product. Today we're sitting at about 12, which is well below that.

Q Do these general reduction techniques that we've been talking about have an effect on environmental tobacco smoke?

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A Some of them do. Particularly the use of expanded tobacco, reduced tobacco weight, faster burning cigarette papers, all will have some effect on environmental tobacco smoke.

Q And to understand the impact of those techniques on environmental tobacco smoke, has Reynolds undertaken any kind of analysis?

A Any kind of analysis of?

Q Of the effect of that.

A Well, we have, and actually it's sort of a gross analysis. Dr. Ogden and another scientist, Dr. Pat Martin, actually did a survey of commercial products in the market. That survey -- in that survey, they collected the 50 most popular brands in the market, evaluated ETS production from those products and found, in general, in general, the lights and ultra low tar products had lower ETS levels.

Q I want to switch topics on you a little bit. We've been talking about cigarette design efforts by Reynolds and the other cigarette manufacturers since the 1950s. To what

extent has the government been involved in evaluating different cigarette designs?

A The U.S. Government has been involved in evaluating a variety of cigarette designs. There was a large experimental effort that began in the mid to late '60s under the direction of the National Cancer Institute. The National Cancer Institute formed the Tobacco Working Group. We talked briefly about that yesterday.

Q What was the goal of the National Cancer Institute program? Do you have a chart that illustrates that?

A Yes, I do. There's a lot of words on this chart. I'll try to simplify it.

The National Cancer Institute directed the Tobacco Working Group, which was composed of scientists from government, scientists from universities and the tobacco industry. And the objective for that work was to identify the characteristics of less hazardous cigarettes that will serve as guidelines for future commercial products.

Also in doing that, they recognized that one of the main tools they were using

in this screen, which was mouse skin painting, are not -- okay. Let me go back.

Success is hindered by the uncertain relationship between tumors resulting from mouse skin painted with condensate and human lung cancer, therefore, these mouse skin painting studies are screening experience.

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But it was an important screening, a screening tool for the Tobacco Working Group to use.

Q How was this program structured? Who was it headed up all that?

A Dr. Geo Gori, who was director at the National Cancer Institute, was in charge of the overall program. He was also chairman of the Tobacco Working Group.

Q And where did the scientists come from that were in the Tobacco Working Group?

A Well, as I've said, the scientists came from the government, including the National Cancer Institute, and other areas that included scientists from universities, the American Health Foundation, from also the Tobacco Institute.

Q Did Reynolds participate in that effort?

A We did have a member of the Tobacco Working Group.

Q And who was in it?

A The first member was Dr. Murray Sinkus from our research and development department. The second member was a Dr. Alan Rodgman.

Q And you talked about Dr. Wynder. Did he participate?

A Wynder was a member of the Tobacco Working Group.

Q And the colleague of his by the name of Dietrich Hoffmann?

A Dietrich Hoffmann who is currently at American Health Foundation, he was also a member.

Q And did Reynolds and the other cigarette companies provide additional support to the NCI program, the National Cancer Institute program?

A We did. In addition to having a member sit on the experimental group, we provided information, suggestions and guidance for that group. We also manufactured thousands and thousands of cigarettes for these experiments.

Q And in particular, what did the NCI TWG group program test?

A Well, they tested a variety of cigarette designs, such as filters, additives, air dilution, tested reconstituted tobacco, tested different types of reconstituted tobacco. Made all these cigarettes, smoked them, collected the smoke and the tar from these products, tried to understand the chemistry of the smoke, tried to understand the biology, particularly with mouse skin painting, but also with Ames mutagenicity tests, and tried to correlate chemistry and tried to see if there were cigarette designs that might be, to use their words, less hazardous.

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Q And were reports generated with respect to the results of all these tests?
A There were a number of reports. I think there were five in total.
Q And I'm not going to try to introduce these to the jury, but just to sort of hold them up here, are these some of the reports that were generated entitled the "First Set of Experimental Cigarettes," and I think

through the fourth set or so?
A Yes. There's actually a fifth report. There are four there.
Q Can you briefly summarize the results of the tests for us?
A Well, one of the major conclusions was they didn't find a correlation between chemistry and the biology. They also did find that some of the designs that they evaluated did reduce mouse skin tumorigenicity. They also found that those designs that reduced mouse skin tumorigenicity were pretty much in place in the commercial market.
Q And were those these general reduction techniques that you've already told the jury about that were being used?
A That's correct.
Q And who came up with the cigarette designs that the government evaluated in that program?
A I think they came primarily from the U.S. cigarette manufacturers, from the industry. There were some suggestions from other areas, but those suggestions didn't really pan out.

Q And did the NCI program reach any final conclusions?
A There were not final conclusions. The program was stopped before final conclusions were issued.
Q And I believe it was terminated in about 1978; is that so?
A That's correct.
Q Now, in addition to the National Cancer Institute Tobacco Working Group program you've been telling the jury about, was there another major conference in about 1979?
A In 1979 there was a major conference called the Banbury conference.
Q What was the Banbury conference all about?
A The Banbury conference was where a number of scientists, including some of the same from the Tobacco Working Group and others, got together to try to understand the literature, understand what has happened in cigarette design and try to decide whether it's possible to design and manufacture, use their words, a safer cigarette, a reduced-risk cigarette, and evaluate whether

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the direction has been correct or if there are other directions that might be fruitful in reducing the risks of smoking.

Q Were the merits of general reduction and selective reduction discussed in that conference?

A They were in detail. I think that was a large part of the discussion. And one of the overall conclusions was that selective reduction is very difficult, it's had only limited success.

One of the other conclusions is that general reduction has been quite successful and has made an effect in the marketplace.

Q Do you have a chart that will illustrate for the jury what those conclusions were?

A Yes. Okay. This is a summary by Geo Gori, and again, he was the director of the National Cancer Institute, also the chairman of the Tobacco Working Group, and he was in charge of the Banbury conference.

If one recognizes the general difficulties in selectively removing specific smoke components, it's not surprising that the most practical solution

is to reduce total smoke emission and, therefore, all smoke components.

Q What's your understanding of conclusions about the role of smoker acceptance in cigarette design that was reached at the Banbury conference?

A The role of smoker acceptance certainly was considered at length in my understanding at the Banbury conference. And here is one of the conclusions. And this is from, again, Professor Wynder: "As a practical matter, it's important to appreciate that a virtually harmless cigarette smoked by only 1 percent of the population will have a lesser impact on the reduction of tobacco-related diseases than a somewhat more harmful cigarette smoked by 80 percent of the total smoking population.

"Research on the less harmful cigarette should therefore be directed toward developing a cigarette containing the lowest possible amount of harmful elements for all tobacco-related diseases but one that has sufficient acceptability for the largest segment of smokers."

Q Were there statements made by participants in the Banbury conference about the responsiveness of the tobacco industry's research and development activities?

A Yes, there were.

Q Do you have a chart that would illustrate that for the jury?

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A Yes.
Q This is also excerpted from the Banbury report, and this is by Dietrich Hoffmann who is a colleague of Ernst Wynder. Hoffmann currently works at the American Health Foundation. He says, "I do think that the tobacco industry adjusts very well to the demands of the logical reasoning of the scientific community and that we should continue on this path."
MR. WESTBROOK: Objection, Your Honor. Could I see this chart just a minute?
Your Honor, I object. That's a misleading statement. They left out the most important words of that ellipse, and I ask that he be required to read the complete sentence of what Dr. Hoffmann said. They

left out important words.
MR. WAGNER: We don't have any objection to that, Your Honor. We'll be happy to.
THE COURT: Go ahead.
THE WITNESS: If you like, I can paraphrase it, or if you like, if you can give me the report, I can read it.
MR. WESTBROOK: I think I can find it, Your Honor.
MR. WAGNER: He can paraphrase it and if you want to read it precisely that's all right, too.
Q Go ahead, Doctor.
A My sense of what this thing says is I do think the tobacco industry, voluntarily or not --
MR. WESTBROOK: Yes, sir, that's the word he left out.
A -- adjusts very well to the demands of the logical reasoning of the scientific community.
Q Doctor, from your review of the Banbury conference and the report, what conclusions did you draw about the contributions of the

tobacco industry in the design of cigarettes in both the National Cancer Institute and the Banbury conference?
A Taken together, what I know about cigarette design and the historical perspectives of cigarette design and the Tobacco Working Group and the Banbury conference work, all of the significant designs that affected general reduction, the successful designs in selective reduction, all of those successful designs have come from the U.S. cigarette industry.
Q All right, Doctor, I want to switch gears a little bit here now and talk for a while about environmental tobacco smoke.
Have Reynolds and the other cigarette

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companies in the United States sought to develop and market cigarettes that would introduce less sidestream and secondhand smoke?

A We have.

Q And explain to the jury why the companies would do that, if they do not believe that environmental tobacco smoke is a demonstrated hazard?

MR. MOTLEY: Excuse me, Your Honor, is he now vouching for other companies and, if so, I think he needs a foundation, who he has talked to, what he's looked at or else we won't be able to properly cross-examine him. He can't just stand up here and say all the companies did this.

THE COURT: Want to rephrase that.

MR. WAGNER: Ill just rephrase that.

MR. MOTLEY: And can he have -- do you have another chart or something?

MR. WAGNER: Yes.

Q As a cigarette designer at Reynolds, can you answer that question for Reynolds?

A I'm sorry, can you rephrase it?

Q The question is, why would Reynolds design cigarettes that address the statements about environmental tobacco smoke if they don't believe that environmental tobacco smoke is a demonstrated hazard?

A I think it's quite simple. Again, from RJ Reynolds' perspective and my involvement in it, we felt and believe that there was consumer demand for cigarettes that might

have reduced sidestream and, consequently, reduced environmental tobacco smoke. So we were responding to what we saw as a potential consumer demand.

Q And what approaches in general has Reynolds tried?

A Well, we've tried a number. And some of the same technique that we've used for general tar and nicotine reduction also affect sidestream and also ETS. Like, particularly, burning less tobacco through the use of expanded tobacco, through the use of reduced tobacco rod length and smaller circumference.

And also we found that one can design cigarette papers to effect a reduction in sidestream and, consequently, ETS as well. So unconventional cigarette papers is another one.

Q What was the first tobacco burning cigarette that was developed by RJ Reynolds with reduced sidestream smoke?

A Actually there were three that we developed all at about the same time: Vantage XL had significant reductions in sidestream and

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ETS. And Horizon and Chelsea, they were all test marketed in the late 1980s.

Q What were the design characteristics of those cigarettes?

A They had very low tobacco rod weight, they had unconventional papers, and also Chelsea and Horizon had aromas associated with them as well to reduce annoyance.

Q And were those brands that you just described successful in the marketplace?

A No, all three failed in the marketplace.

Q Has Reynolds given up on the idea of developing a tobacco-burning cigarette with reduced sidestream smoke?

A No, we didn't give up then and we haven't given up now.

Q To your knowledge, have other companies marketed tobacco-burning cigarettes which reduced sidestream smoke?

A I think a number of our competitors have marketed reduced sidestream smoke products. For example, Philip Morris has marketed a Virginia Slims Super Slims, a very small circumference or small diameter product because of the low tobacco weight generates

less sidestream.

Another competitor, Brown & Williamson, has marketed a Capri, which is a super skinny cigarette; again, because it has very low tobacco rod weight, generates less sidestream.

Internationally there have been a few other introductions, like in Canada, one of our competitors, I believe it was Imperial, introduced a product called Passport that used an unconventional specialty paper to try to reduce sidestream.

Q Now, the jury has heard a little bit about Premier. Is Premier a cigarette that heats rather than burns tobacco?

A Premier is a cigarette that is a major design change in that it heats rather than burns tobacco.

Q And when did Reynolds invent and develop Premier?

A Well, the development of Premier, actually, was a lengthy process, and it started in the early '80s, around 1980, particularly in 1981; carried on throughout the '80s to its ultimate test market which began in 1988.

Q And how would you characterize the development effort of Reynolds to develop the Premier?

A It's the largest project I've ever seen at Reynolds. We had scientists fully dedicated to that project. We spent a lot of money, a lot of effort to get outside consultants.

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Largest project I've ever seen.
Q How expensive was it?
A Well, it's kind of hard to tell. I would say generally in the hundreds of millions of dollars to develop that product.
Q Tell us a little bit about how intensive the project was and the kinds of things that had to be done.
A Well, it was intensive. And in essence, we had a large fraction of our total R & D effort focussed on a number of technical problems: Materials related, how to build it, consumer testing, and exactly trying to understand how this product performed. An extremely intensive effort.

Alongside this we had the manufacturing effort that was extremely intensive because we were starting with a product design that

was so different we didn't have a way to make it. So we had to go out and develop new suppliers of equipment, companies that had never worked with the tobacco industry before, to try to use existing technology and then try to bring it up to exactly what we needed, inventing new technologies for manufacture.

So the research and development effort in the alternate manufacturing approaches were going down the road at the same time. Very intensive.
Q And was this a riskier project than the ordinary projects that were undertaken at Reynolds?
A I think it was extremely risky, primarily because we didn't understand how to make it and we weren't sure quite what the design ought to be. But we were marching down the road in a very driven and focused way.

The manufacturing problems could have stopped the project. The product problems could have stopped the project. Normally our projects are more sequential and more logical in the way they're laid out. We

develop a product, we understand it thoroughly, and then we try to figure out how to manufacture it.
Q You told us earlier, I think, that one of the first things that a cigarette designer does is to develop design objectives; is that right?
A That's correct.
Q What were the design objectives for Premier?
A There were three major design objectives for Premier. The first was to build a product that had greatly simplified smoke chemistry in the mainstream smoke. So simplified smoke chemistry.

The second main objective was reduced biology for mainstream smoke. So we got

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reduced chemistry, reduced biology. And then the third objective was a substantial reduction in ETS.

Q Doctor, I'd like for you to explain the design of Premier. Do you have a pack of Premier and a chart that would help you in that respect?

A I do.

MR. WAGNER: And, Your Honor, with

your permission, could we distribute to the jury one of the cigarettes from the package of Premier?

THE COURT: That will be fine.

A This is a cutaway diagram of Premier. And I have some products -- these are actually old. These are from the late 1980s.

Q I think if you hand those to Mr. Cassell after you get done talking about them, Dr. Townsend.

A We had non-menthol version and menthol version, of course.

Now, Premier --

Maybe we'll just go ahead and pass them out and I can talk while they're being distributed. If you would just take one.

Okay. Premier has a surface that looks pretty much like a regular cigarette, a normal cigarette, with one exception. It has a carbon heat source in the front end. The carbon heat source is, in fact, what burns, not tobacco. The carbon heat source is wrapped with a fiberglass insulating material, a glass mat insulating material, and then the heat source is inserted into an

aluminum capsule that contains alpha alumina beads. And on the surface of these alpha alumina beads is tobacco, spray-dried tobacco.

Outside the capsule is a small layer of tobacco all the way around the capsule. The whole thing is wrapped in paper. Back down here we have a tobacco paper plug to help deliver flavor. And then we have a very inefficient long filter section.

Now, what I'd like to do, if I may, Your Honor, is take one of these apart for the jury.

THE COURT: Go ahead.

A And I'll break this apart. This happened to be the menthol version and notice a carbon filter plug here that carries the menthol. Behind that is the filter section which we see in the diagram.

But let's turn our attention primarily to the business end of the cigarette where we've got the tobacco jacket around the aluminum capsule. Feel free to tear yours open if you like. And if I tear the -- I'll try not to make too big a mess here. If you

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pull this out of the tobacco jacket, what this is is the carbon heat source and the aluminum capsule. And you'll notice that there are slots in the back of the aluminum capsule for the tobacco flavors and smoke to exit.

Now, if I tear this aluminum capsule open -- and I am making a mess -- but if I tear this aluminum capsule open, I can pour out the insides, which are these little alpha lumina beads. And on the surface of the alpha lumina beads is spray-dried tobacco material.

This also contains a high concentration of glycerin. Glycerin will form a smoke. And so when the fuel source, the heat source, the carbon, heats air that comes into this capsule, it drives off glycerin, tobacco flavors, nicotine. As those gases exit these slots on the back, they cool, form a smoke, and you can actually see a smoke cloud. And you can inhale that smoke cloud. But the smoke is primarily glycerin, and there is not tobacco combustion products. What we've done is we've stepped

away from products of combustion tobacco.

Feel free to tear that apart if you'd like.

Q Does that complete your explanation there of how Premier works, Doctor?

A I'm sorry. I get kind of long winded.

Q It's quite all right. Anything more you need to do with the chart?

A I don't think so.

Q Okay. Can you tell the jury the difference between the tar of an ordinary cigarette versus tar from Premier or do you have a chart that would help illustrate that?

A Yes. The tar, as I just said, the tar from Premier is primarily glycerin, not tobacco combustion products. The tar from other cigarettes is primarily tobacco combustion products and only a small amount of glycerin. We do use glycerin as a humectant in cigarettes as I've already said, I believe, yesterday.

Because of the major change in smoke composition of mainstream smoke, we see a lot of differences. What I've done here is compared -- this is a Cambridge filter pad

like used in a smoking machine to collect all the particulates. And you'll see here is a high tar cigarette, 40 milligrams per cigarette, and you'll see that the tar collected is quite brown.

Another product at 20 milligrams, another product at 11, and then another down

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here at six, and one of the lowest tar products at two. So this is, again, material collected on this very efficient Cambridge filter pad used in smoking machines.

This far right picture on the bottom is the same pad collected for Premier. And Premier delivered 8 milligrams of tar, so 8 milligrams of tar would be somewhere between here and here if it were a conventional product. It would be between these two in color. But, in fact, we see there is no color. Again, because it's primarily glycerin and no tobacco combustion products.

Q And was Premier also subjected to biological tests?

A We did.

Q And were there any tests employed in which Premier did not perform as favorably as conventional cigarettes?

A All of the biological testing that we conducted showed reductions compared to conventional cigarettes.

Q And did Premier produce lower or no environmental tobacco smoke?

A It had major reductions in environmental tobacco smoke.

Q Did Reynolds report the results of the chemical and biological tests on Premier?

A We did.

Q And is there a monograph that was also prepared on Premier that you have with you?

A There is. Actually Reynolds published in peer-reviewed journals quite a lot of its research, particularly the biological research done on Premier.

But in addition to that, Reynolds wanted to put together a complete compilation of the Premier research and development. That's in this monograph that RJ Reynolds published.

Q And what was the reaction of the tobacco

scientific community to the introduction of Premier?

A Well, it was mixed. Some scientists saw this as a significant advance in product design to possibly reduce the health risks of smoking.

Other scientists, however, for a variety of reasons, sought to ban this product from the market, petitioned the Food and Drug Administration to assert jurisdiction and keep this product off the market.

Q And was Premier introduced into test markets?

A It was introduced in late 1988 into three test markets.

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Q And where was that?
A The three test markets were St. Louis, Tucson and Phoenix, Arizona.
Q And how did Premier fair in the test markets?
A It failed in the test markets. It had quite different smoking characteristics, taste characteristics. We found consumers told us it was somewhat hard to light. Some

consumers were concerned because it didn't burn down like a normal cigarette; it stays its full length. In fact, it doesn't burn. But very different taste characteristics, different aroma and odor. It failed in the marketplace.
Q Laying to one side the commercial failure, would it have been possible, in your opinion, or technically feasible to develop Premier earlier than the time it was, in fact, developed?
A I don't believe Premier could have been developed earlier. We had to develop entirely new manufacturing approaches, we had to develop new materials. And, in fact, this alpha lumina beads that I showed you inside the capsule, is a relatively new material at that time.
So we were using very different materials. Some of these materials had just been available. New manufacturing techniques. And then the other thing is, we had to get the idea, the concept, well in place from many different angles to get that project going.

Q As a cigarette designer, what conclusions do you draw from Reynolds' experience with the Premier cigarette?
A That consumer acceptance of any product and including new product designs like this is essential.
Q Now, after Premier, did Reynolds give up its efforts to develop and market a cigarette that heated rather than burned tobacco?
A No, we didn't. Obviously, we were very disappointed in the way this product performed in the marketplace, we stopped the Premier project, and we immediately began another project called Eclipse. The objective of Eclipse was to try to develop a similar product but one that was consumer acceptable.
Q Can you tell the jury how Eclipse compares with Premier.
A Yes. If -- and I hope I've made it clear that Premier did not burn tobacco. It burned this heat source. It only heated tobacco.
In Eclipse what we've done is actually stepped back and said, to get some consumer

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acceptance, maybe we need to burn very, very small amounts of tobacco. Still keep the smoke much greatly simplified, keep the biology reduced, but burn just enough tobacco to get some consumer acceptance.

So Eclipse, you'll notice, we've taken out the capsule. We've replaced it with two beds of processed tobacco materials. One we call a substrate, one we call a processed tobacco roll.

Again, we have the carbon heat source in the front. Around the carbon heat source we have a real thin, small piece of tobacco reconstituted paper. That will burn, hopefully, to give some taste, some improved taste characteristics. A very small amount of tobacco behind this carbon heat source will also burn and will give some improved taste characteristics.

But by and large it's the same overall approach but trying to improve consumer acceptance.

Q Do you have a chart also, I think maybe one we skipped over, talking about Premier that illustrates the tar characteristics of

Premier versus conventional cigarettes?

A Right. I think what you're referring to is sidestream components.

Q Yes.

A This is a chart for Premier where, again, remember, one of our objectives was to effect a substantial reduction in ETS yields. This is an analysis of sidestream, a variety of measures, analytes, and over here, comparing Premier versus a 1R4F product, which is an industry reference product actually.

Over here on the right-hand column I've shown the percent reduction compared to that tobacco-burning control product. And you'll notice that the percent reduction in most cases is in the 80 to high 90 percents. Some analytes, to be fair, like carbon dioxide and formaldehyde, are only 55 to 64 percent reduced.

Q And then going back to Eclipse again then, how does the tar of Eclipse differ from tobacco-burned cigarettes?

A Well, like Premier, Eclipse smoke is primarily glycerin. And let me just

summarize the smoke composition by saying glycerin, in a conventional cigarette that burns tobacco, about 20 to 25 percent of the total smoke is glycerin and 75 to 80 percent of the total smoke is tobacco combustion products.

Eclipse is exactly the reverse of that.

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Eclipse has somewhere around 75 to 80 percent glycerin and only 20 to 25 percent tobacco combustion products.

You'll notice now we are burning a small amount of tobacco but the smoke is still quite similar compared to conventional cigarettes.

Q What are the tar and nicotine yields of Eclipse?

A The tar and nicotine yield, let me back up, for Premier was about 8 milligrams per cigarette. Again, mostly glycerin. For Eclipse we have two versions in the test market that's going on today. One is 3 milligrams per cigarette; the other version is a 2-milligram-per-cigarette product.

Q And could the Eclipse cigarette have been

developed and marketed earlier than it was, in fact?

A It's my opinion that it couldn't have. I mean, obviously, the Eclipse project is learning from the problems in Premier. So it's a sequential learning and developing and trying to drive toward a consumer acceptable product.

Q And does Eclipse reduce secondhand smoke?

A It does.

Q Do you have a chart that would illustrate how it compared to other cigarettes in that respect?

A Yes. Now, this is a chart for ETS, secondhand smoke, from Eclipse. And, again, what I've done is tallied the reductions compared to the Kentucky reference tobacco-burning product. And you'll notice that the number of particulates in ETS, major reduction, about 80 to 85 percent reduction. And then for a number of targets, very high reductions of these specific analytes. So my conclusion is a major reduction in ETS for Eclipse.

Q Do you have a similar chart for Premier?

A I do. The first chart I showed you for Premier, in fact, was sidestream. We, of course, had measured ETS levels for Premier and like, in the case of Eclipse, we see major reductions in ETS, gross measures, and analytes.

Q Dr. Townsend, I think I can ask you to resume the witness stand if you will, please.

Dr. Townsend, there has been some testimony in this case about a fire-safe cigarette. Are you familiar with that design concept?

A Yes, I am.

Q And have you, in fact, written and published in that area?

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A Yes, I have.
Q Tell the jury how work on a fire-safe cigarette came about.
A Well, the fire-safe cigarette question or issue has been around for a number of years. Scientists at Reynolds have worked in the area trying to evaluate a variety of patents that are out there, even back as early as the early 1970s. Because it's recognized

that cigarettes can be a fire risk if improperly handled.

In the early '80s, however, Congress passed a law, and I believe it was 1983 or 1984, 1984 Cigarette Fire Safety Act. The Cigarette Fire Safety Act directed a group of scientists, technical experts, to determine if it's feasible to design cigarettes that might have reduced ignition propensity, or reduced probability of starting a fire if you accidentally drop it.

That study group, called the Cigarette Fire Safety Technical Study Group, took about three years, did a large number of experiments to try to determine if it was feasible, and then presented a report to Congress.

Q And were you a member of that study group?
A Yes, I was.
Q What was the basic design of the fire-safe cigarette?
A Let me say that there are ways to design cigarettes to make them less likely to ignite a laboratory mockup or a laboratory analysis. That doesn't necessarily mean

it's fire safe because, as long as the cigarette is burning, it's going to have some fire risk. But the designs that were identified included low tobacco weight, low porosity paper, and smaller circumference. Those were the primary design variables.

Q And did that fire-safe cigarette design that you described to the jury result in less sidestream smoke?
A Those major design variables that reduce ignition propensity by that lab measure do, in general, reduce sidestream smoke.
Q And was there a consumer test, acceptability test, I should say, of the fire-safe cigarette?
A Well, at Reynolds, I can only speak for Reynolds consumer testing. We've evaluated a large number of prototypes with consumers, large scale, mail-out consumer tests, in an attempt to develop consumer acceptable low-ignition propensity cigarettes. All of those consumer tests so far have not turned out well. We find that those products are not consumer acceptable.
Q And were there other factors that tobacco

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scientists said had to be evaluated if these cigarettes were commercially sold?

A Well, I think there were a number of factors. One of the -- and two come immediately to mind. The first is there is no, even as we sit here today, there is no meaningful test method that can relate the laboratory -- there is no meaningful laboratory test that has been shown to relate to fires in the real world. That's still an issue of debate and I think a standard setting organization right now is engaged in that debate, ASTM.

The second issue is that during this technical study group work of the early '80s, there were a number of questions raised by scientists, for example, Dr. Hoffmann, Dietrich Hoffmann, from the American Health Foundation, and he raised questions about if you make these major design changes, are you increasing the risk to the smoker. And that then led into a series of scientific questions and debates which fed into the work of the next Congressionally-mandated study which began

in 1994.

So Congress, I think, recognized at that point that one needs to understand, if you make major design changes, are you changing the chemistry in a way that you're increasing the risks of smoking.

Q And I believe that in 1990 Congress passed another act that created an advisory group; is that correct?

A That's correct. Congress passed the Fire-Safe Cigarette Act of 1990. That directed two -- well, primarily two government agencies; the National Institute of Standards and Technology, which used to be known as National Bureau of Standards. And it also directed the U.S. Consumer Product Safety Commission to do certain projects.

The National Bureau of Standards projects was to develop a meaningful test; the Consumer Product Safety Commission was to consider these smoke toxicity issues. It was also to consider and understand cigarette fires in the real world, to do some surveys, a number of things.

Q And was there anything secret about this work that you've described on a fire-safe cigarette?

A No. It's all been published by the government. And actually that work resulted in a number of or several peer-reviewed publications as well.

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Q Now, Doctor, I want to switch topics on you. The jury has heard about a 1962 memorandum that was drafted by Alan Rodgman that's in evidence in this case as Exhibit 1433.

MR. WAGER: And may I give a copy to the witness, Your Honor?

THE COURT: Go ahead.

Q Are you familiar with that exhibit, Doctor?

A I have read this document.

Q And how is it that you're familiar with it?

A Well, it was produced sometime last year in litigation. I believe it was last year.

Q And are you familiar with the passage in this document, which I believe is on page 13, where Dr. Rodgman discusses certain research conducted at Reynolds that was not published?

A I have read that passage, yes, sir.

Q Let me ask kind of a general question first of all. Do the scientists at Reynolds publish all of their research?

A No, we don't.

Q And why not?

A In fact, we don't publish information that's competitively sensitive that we think will give us an upper hand in the commercial market. So proprietary information is generally not published.

Also information that we may gather that's already in the public domain, has already been published by others in the scientific literature, we won't publish that either. And, in fact, most editors of peer-reviewed journals won't accept papers that -- which contain information or scientific material that's already been published by others.

So we do, however, encourage our scientists to publish information that adds to the scientific understanding, that adds to the scientific knowledge base, and is not competitively sensitive.

Q All right. Dr. Townsend, I want to direct

your attention to page 13, and do you see there on that page where Dr. Rodgman states that members of his research team have studied cigarette smoke in great detail and that while some of the findings have been published, much data remain unpublished because they were concerned with carcinogenic or co-carcinogenic compounds?

A I see that passage.

Q After you saw this memorandum, did you check to see whether the compounds that were listed in the memorandum were made known to the scientific community?

A Actually I've investigated this, yes, sir. And the reason is because this sentence, "However, much data remain unpublished

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because they're concerned with carcinogenic or co-carcinogenic compounds or with patentable material," I certainly understand that last phrase, "with patentable material," but not the first phrase, so that concerned me.

What I've done, or what I did was actually go back to the individual references, and I think there are about 17

references cited there. I've examined those internal RJ Reynolds' documents that Dr. Rodgman refers to, and I find that they actually address a number of different things.

Some of those reports deal with new test method development, not the identification of new compounds. Some of those reports deal with the identification and attempts to remove precursors to the formation of either benzo(a)pyrene or other polycyclic aromatic hydrocarbons, or precursors to the phenols. So those are aimed at selective reduction.

There was also even one or maybe two reports, as I recall, dealing with selective filtration of benzo(a)pyrene or phenols. And there were some reports dealing with the identification of smoke constituents, which is to the point here.

Q And what did you conclude as to whether or not those components of cigarettes were, in fact, published?

A What I found was that in those few reports out of these 17 that do deal with cigarette

smoke constituent identification, Dr. Rodgman in some of those reports listed extremely long lists of known polycyclic aromatic hydrocarbons, and phenols, that were believed or known to be in cigarette smoke. And then he actually would go in and sometimes evaluate how they were identified.

In particular, my conclusion is that Dr. Rodgman didn't accept UV spectroscopy as a positive identification and so he, in fact, went back to the laboratory for many of the known compounds that were already reported in the literature and did a positive identification.

The short of all this is, is that I found and, in fact, Dr. Rodgman refers to it back on page 6.

Q Yes. Page 6 of the same document?

A Page 6 of the same document by Dr. Rodgman. It says here -- and again remember there were two major types of compounds, groups of compounds considered; polycyclic aromatic hydrocarbons and phenols.

And Dr. Rodgman says, "Cigarette smoke contains 14 polycyclic hydrocarbons and

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three heterocyclic nitrogen compounds known to be carcinogenic to mouse skin." Then he goes on to say, "The hydrocarbons include benz(a)anthracene" and then there's the list of those 14 plus three.

Now, he references, for the polycyclic he references 27 and there's a footnote. 27, as I recall, is a researcher by the name of Davies, and Dr. Rodgman's footnote was, "This author discusses all of the polycyclic hydrocarbons except cholanthrene." So all of the ones under consideration here were already reported by Davies except cholanthrene.

And also I found from internal documents that Dr. Rodgman presented the presence of cholanthrene in cigarette smoke at an American Chemical Society meeting several years later.

If we turn to the second type of compound that he's referring to in here, the phenols, I find that, from his documents, that all of the phenols that were discussed in these references were already in the published literature with the exception of

two. And they were compounds that Dr. Rodgman identified and they were called eugenol and isoeugenol. So those were two new ones that weren't known in the scientific literature, and he did present that at a scientific -- I beg your pardon?

Q No, I think someone just sneezed.

A And he did present the identification of eugenol and isoeugenol at a technical meeting in 1964 and also presented it in a peer-reviewed publication in 1964.

Q So is the bottom line, then, that all of the compounds he was referring to were, in fact, published?

A The bottom line is that all the compounds discussed in these reports that I've seen, and going through every one of his references, all of the compounds were already in the literature, maybe not to Dr. Rodgman's satisfaction of positive identification, but they were referenced in the literature as smoke constituents, with the exception of cholanthrene, which he then presented at American Chemical Society, and with the exception of eugenol and isoeugenol

which he both published and presented.

Q All right, Doctor, let me switch over to a different topic here and the topic is ammonia. Tell us about ammonia and its use in cigarette manufacturing.

A Well, ammonia has been used in cigarette manufacture by RJ Reynolds for a number of

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years. I think we've investigated it, oh, gee, I can't remember the earliest reference. There have been quite a lot of research and development studies. And ammonia has been used in commercial products at Reynolds since 1974.

Q And what is it used for?

A What we find is that ammonia, or ammonia compounds added to tobacco, and particularly if it's then heated after the ammonia is added, results in the production of reaction products with sugars. Ammonia can react very efficiently with certain sugars and form very flavorful compounds. Some of those flavorful compounds that we think are most important are a class of compounds called pyrazines.

Q And is it also used to increase the sheet

strength sometimes?

A Well, I think that's a side benefit. My take on the internal information, internal literature is that the primary reason is for taste improvement through these production of these flavorful compounds.

The secondary reaction is if you use it in reconstituted sheet, the ammonia or ammonia compounds can release pectin, which are naturally occurring in tobaccos, which then cross-link when you form the sheet to help improve sheet strength.

Q Now, Doctor, in the 1970s were there scientists who thought that adding ammonia would increase the nicotine kick or impact and have you seen such discussions in documents?

A I think there were a number of scientists at Reynolds and outside of Reynolds and outside the industry who considered that as a possible theory.

Q And does it do that?

A Well, this is a complicated area. Let me, if I may.

Q Sure, please explain.

A I could probably explain best if I could draw on a chart.

Q Sure.

MR. WAGNER: May he step down, Your Honor?

THE COURT: Sure.

A This is a, technically, very complicated area, and I've just said that the use of ammonia at RJ Reynolds, in my opinion, is to increase the flavor characteristics of cigarettes. However, that being said, there are scientists at Reynolds in the past who have held out this theory about the involvement of ammonia and nicotine. And let me try to describe this fairly complicated theory as simply as I can.

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If one adds ammonia, NH3, or ammonium compounds, either one, the theory has it that if you do that, you increase pH.

Q What is pH?

A PH is a measure of acidity or basicity. Let me try to draw that for you down here. It's a scale. It's a logarithmic scale. And pH values range from 0 to 14 and 7, of course right in the middle is neutral, 14 is very

basic, and 0 is very acidic. So it's a measure of acidity or basicity. The idea is if you add ammonia, which is a base, you can increase pH toward the more basic side.

Now, cigarette smoke, in general, sits right here at about 6, so it's just on the slightly acidic side of neutral.

Then the theory goes on to suggest that if you add ammonia, that would result in an increase in pH, which would then give you more free nicotine.

And let me describe what free nicotine is. Nicotine is present in cigarette smoke primarily in the particulate phase or in these little droplets. And it's present -- let me draw a structure of nicotine. That's nicotine, and it's present in the particulate phase of cigarette smoke primarily as the salt, which means that it's got an acid hydrogen ion associated with it to form a salt, together with some anion, I will just call it A minus, and this salt is not volatile. It's not volatile at all. Because it's not volatile, it stays in these particles as this salt.

Now, the theory is, that if one increases the pH, makes the particles more basic, you can actually free this through an equilibrium to give the free nicotine. Which doesn't have that proton on it or that hydrogen ion. And this free nicotine is somewhat volatile. We call it semi-volatile. So it can exist in both the particulate phase and the gas phase.

So let me back up. Adding this base ammonia or ammonium salts, the theory is it increases pH, which would give you more of this free nicotine which is available now in the gas phase. And what that would lead to, the theory says, is either more absorption of nicotine or faster absorption of nicotine.

I've looked at this quite a lot, and a lot of scientists have, both inside and outside the industry. Is this a crazy hypothesis? No, not really. Not really. That's why it's been looked at so much.

However, what do we know? We know at the levels that ammonia, as I believe from my look at the documents, that the levels of

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ammonia or ammonia compounds that are used don't result in more absorption.

What we know from RJ Reynolds' research as well as research outside of the company and the industry, is that when a smoker inhales cigarette smoke, essentially all of the nicotine that's inhaled stays in the smoker. It doesn't come back out. So the retentions of nicotine are almost 100 percent. They're very, very high retention levels of nicotine.

So it's hard to imagine that going through this would increase the absorption and give you more nicotine when most smokers retain essentially all the nicotine or most of the nicotine in the first place. So let me do that.

Would doing this increase the rate of absorption, make the absorption of nicotine by the smoker faster? It might. What we know is that the absorption of nicotine in any form, whether it's the salt or the free, is extremely fast, and the nicotine, when it's inhaled, does get into the body very quickly. The absorption is extremely rapid.

And if this happened, we would be looking at making it a little bit faster when it's already very fast.

Is it possible? Sure, it's possible. Are there data that show that this happened? No, there are not. I haven't been able to find data and scientists at Reynolds haven't been able to find data that shows if you do this, you get faster absorption.

It's got to be a tough experiment to do because the absorption of nicotine is so fast in the first place. How do you do that? I don't know. But I've never seen data that demonstrates this.

All of that said, let me come back to one thing that I have looked at very, very much recently, and I'll turn this slide back over in just a minute. What do we know from looking at RJ Reynolds' internal data? We've measured pH over the years. We don't do it routinely in manufacturing, but we have a lot of numbers. If I plot pH versus time, say for Winston, let's take Winston as an example. And we've got starting here at 1971 up to the present, the pH value bounces

around a little bit, and it will do that. But if you look at the overall -- and let me back up. And it bounces around somewhere in the neighborhood of six on the average, just a rough estimate.

And we know that the method that we use to measure pH, if we take repeated samples

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of the same cigarette and we measure them over and over and over, the variability and the answer we get is about plus or minus .2. Which is pretty much what we see the spread of this bouncing around over time is.

In any event, my examination of this -- these data, shows that, over time, beginning in '71 for Winston, I believe that the pH hasn't gone up. Now, we ammoniated Winston, added ammonia to the blend for Winston in 1979 the first time. That's the first time for Winston. We've done it earlier for Camel. We don't see a jump up. I don't see a jump up in the pH.

In 1997 we took ammonia out of the tobacco blend because we made Winston with no additives to the tobacco. So that necessarily means we can't -- we wouldn't

want to use ammonia as an additive. So we took it out, and the number is the same.

The number in 1996 for Winston was 6.0. The number in 1997 with the no tobacco additive product 6.0.

So that's my examination of our internal Reynolds' data which tells me that there is no evidence that pH is increased. We have added ammonia. We've already told you why we've added ammonia. There is no evidence that I've seen that pH in commercial products has increased. Could it? Of course. If we add a lot of ammonia, much higher levels than we use in processing, I think it's entirely possible to increase this and probably get more free nicotine. I don't know what that would mean to the absorption rate.

Q Doctor, thank you. If you'll resume your seat.

Doctor, we're about ready to close here on your direct examination. Can you sum up for us the contributions of Reynolds and the other tobacco companies in the field of cigarette design?

A Yes. I believe that RJ Reynolds and my competitors in the United States certainly have first rate research and development organizations. I believe that we've identified -- we've monitored the smoking and health literature very closely and very carefully since the early '50s. I think we've considered the various theories that have been placed on the table by the scientific community. I think we've responded to those theories to the best of our ability, both in selective reduction, which has had limited success, and in general reduction, which has actually been quite successful in the marketplace.

Q And has Reynolds, in your opinion, ignored

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any reasonable theories on smoking and health proposed by critics and the government and tobacco scientists?

A I've never seen a reasonable theory ignored at Reynolds. I think my experience has been when theories are developed and they're placed on the table, we look at them very carefully and we consider them.

MR. WAGNER: Thank you,

Dr. Townsend. That's all I have on direct, Your Honor.

THE COURT: All right. Thank you, Mr. Wagner.

Mr. Westbrook.

MR. MOTLEY: Can we approach one second, Judge?

THE COURT: All right.

(Bench discussion)

CROSS-EXAMINATION

BY MR. WESTBROOK:

Q Hello, Dr. Townsend.

A Good morning.

Q You and I have never had an opportunity to talk in court, have we?

A No, we haven't.

Q We met once before down in Winston-Salem, I believe?

A We did meet once. There was a deposition and you were there.

Q Doctor, you said on direct a number of times, the scientific community has not agreed on what in cigarette smoke causes lung cancer. Is that a good paraphrase of your testimony?

A I think that's fair and that's certainly my assessment from looking at a variety of pieces of literature.

Q But the scientific community has agreed that smoking causes lung cancer with the exception of the tobacco company and its scientists?

A I think the general opinion is among the medical community and, frankly, among most people in this country, is that cigarette smoking causes lung cancer.

Q And you disagree with that?

A Well, I'm not an expert in this area, but I will tell you that after looking at some information, I believe that there are some missing pieces to demonstrate causation. I'm not an expert in causation.

What I do know is that cigarette smokers, as a group, have higher incidence of lung cancer, but I don't think it's demonstrated scientifically that cigarette smoking by itself, in itself, causes lung cancer.

Q I want to get this statement: "Cigarette smoking causes lung cancer," and your

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answer, Dr. Townsend, is yes or no?
A My answer is neither. My answer is I don't know whether it does.
Q Don't know. Okay.
And you would agree that in the yes category, I could fill 30 sheets with the organizations and scientists who have studied this issue and have said yes, cigarette smoke causes lung cancer; wouldn't you?
A I think that would be quite a large list.
Q All right. And how about in the no category. Can you think of anybody who you could put in the no category?
A Well, I don't know. I've not gone out and done a poll of people on which side they fall.
Q Do you know anybody?
A Do I know anybody at all?
Q Yes, sir.
A Are you talking about specific to this area, or this question?
Q I'm talking about somebody outside the tobacco industry who hasn't been funded by the tobacco industry who would say cigarette

smoke does not cause lung cancer?
A Well --
Q A name.
A I can't -- I can't tell you because I'm not an expert in this area, frankly. I haven't gone out and worked with people who are medical researchers, people who are mechanistic biochemical researchers to know exactly how they fall down. I do know that cigarette smoking is a risk for a number of diseases. I don't know whether cigarette smoking causes those diseases. It may. It's certainly a complex mixture. It may cause those diseases, but what we don't know is if cigarette smoking by itself and in itself causes cancer.
Q Doctor, is your answer that you don't have a name to put in here?
A I think that's fair. I'm not an expert in that area.
Q How many cigarettes does Reynolds sell a year, ballpark?
A Presently we're selling about 118 billion cigarettes.
Q 118 billion. Does that work out to you sell

about 500 million cigarettes a day?
A Well, we could divide that out.
Q Well, I'm just thinking if there are 118 days in a year, you would sell a billion a day, so I doubled it and I said about 500 million?
A There is more than twice 118 days in a year,

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aren't there?
Q I doubled it. Should we triple it?
A You could pull out a calculator. I mean, I'll accept --
Q 300 million a day?
A My estimate is that we manufacture and shipped about 118 billion last year.
Q And when you said that you manufactured a couple thousand or thousands of cigarettes for that Tobacco Working Group, that was a couple minutes' production, wasn't it?
A No, that's not fair. Because when you manufacture experimental cigarettes that have unusual characteristics, it takes days, actually, to do an experiment like that. It's not a major problem, but it takes days. I don't think -- you're being a bit trivial on it.

Q How many cigarette brands, within the brand family, how many cigarette brands does Reynolds make?
A Are you talking about brand families?
Q Yes.
A We manufacture and sell in the United States, I'll give you our major ones. Winston brand family.
Q Just the number. I don't want the names.
A Let me count them then. Winston, Salem, Camel, Moore, Now, Century. I would say seven or eight major brand styles, brand families.
Q Within those seven or eight major brands, I think you said you had some variations, counting the variations, how many different -- if you lined up all the packs of cigarettes, types of packs that Reynolds sells, how many different packs could I have to choose from?
A If you're talking about all the different individual brand styles that Reynolds sells, I can't give you a concrete number. We sell quite a lot of generics or even private label products. It's several hundred.

Q Several hundred. Is there something different about each of that several hundred brand styles?
A There are many differences among those brand styles, but I don't think every brand style is unique from necessarily another one. There is some overlap. For example, many of the private label lights products are essentially the same product as other private label lights products.
Q Okay. Counting the several hundred brand styles, whatever the number may be, can you tell me, Dr. Townsend, which of them is RJR's safe cigarette? What's the name of the safe cigarette that Reynolds sells?
A Well, I have no way of knowing that. I

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think there is no way -- I've spent most of my career at Reynolds, and other scientists have at Reynolds as well, trying to reduce the chemistry and consequently hopefully reduce the biology of mainstream smoke. But I don't know of a way that we can demonstrate, even if we are successful in doing that, whether one cigarette is safer than another, because the diseases that are

associated with cigarette smoking are chronic diseases. I don't know how to demonstrate whether one product is safer than another.

Q You had a chart on direct and you showed some cigarettes that were what you called high tar. They were -- they were at the upper end of the range, and a lot of those were in the 50s, and then you showed lower tar coming down on average; correct? Something called high-tar and low-tar cigarettes?

A What I tried to represent on the chart I think you're referring to is the highest and lowest product we sold as a function of year. And what I tried to demonstrate was that the range of tar level products that we offer to consumers is much broader, and the entire range is much lower than it used to be.

Q You have something called a high tar, low tar and then ultra low tar?

A Well, we commonly refer to it as ultra low tar, then the category up from that is low tar, and the category up from that is full

flavor.

Q You don't call it high tar, do you, hopefully?

A It's certainly higher tar than low tar.

Q Okay. As between the high tar, the low tar and the ultra low tar, tell me which group of cigarettes is safer for people to smoke?

A I don't know how to do that. I don't know how to demonstrate whether one product is safer than another, as I've already said.

What we have done is we've responded to the scientific community and to consumers in the call for lower tar products, and we've delivered a range to consumers of products to choose among.

Q So as far as you know, an ultra low tar cigarette may be just as dangerous as a high-tar cigarette?

MR. WAGNER: Objection, Your Honor. It's been asked and answered now three times.

MR. WESTBROOK: I don't believe so, Your Honor. I think I'm trying to get the answer.

THE COURT: Why don't you rephrase

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that.
Q Dr. Townsend, in your view, is an ultra low tar cigarette a safer cigarette on the market than a high-tar cigarette?
MR. WAGNER: Asked and answered.
THE COURT: You may answer.
A As I think I've already said, I don't know how to determine whether any product is safer than another. To me, what does common sense tell me? If I show an ultra low tar product, common sense tells me that that might be, but I don't know any way to demonstrate that.
Q All right. As opposed to might be, you don't know?
A I just told you my common sense reaction, if something may be a health risk, whether it's cigarette smoking or something else, generally toxicology and generally common sense says that less may be better.
However, I don't know scientifically that there is any way to demonstrate that one cigarette is safer than another.
Q All right. You said toward the end of your direct examination concerning your looking

at nicotine that you had some information that smokers retain most of the nicotine that they inhale; is that right?
A We've done retention studies, smoker retention studies within Reynolds. There have been a number of similar studies outside of Reynolds and outside of the industry that are published, and I think overall my conclusion from this work is that smokers retain most, if not virtually all, of the nicotine that's inhaled.
Q All right. So if smokers retain most, if not all of the nicotine that's inhaled, how do researchers pick up nicotine in the air in a building when they go in there around where there has been smoking; where does that nicotine come from?
A Well, sidestream smoke is a major contributor. During the smoking of a cigarette, approximately -- this is just a ballpark figure, two-thirds of the tobacco rod is burned during smolder, in general, and a third is burned in puffing. So roughly two-thirds of the tobacco burned during smolder generates sidestream smoke

which contains nicotine.
Q So the sidestream smoke, wherever it comes off, two-thirds of the smoke of a cigarette comes off the sidestream?
A I'm saying that's a general rule of thumb. It depends.
Q Okay. So one-third of the total smoke is

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the mainstream smoke?
A That's correct.
Q So, Doctor, if there is evidence in this case that the hospital in which Mrs. Wiley worked had ceilings and walls which were yellow stained in the smoking lounges and smoking areas, where do you think the source of that yellow stain came from? Did it come from the sidestream smoke or did it come from the mainstream smoke?
A Well, I'm not an expert in this area. I don't know. I haven't evaluated this sort of thing.
Q When you say two-thirds of the smoke of a cigarette comes off, when the smoker smokes, if we were to draw, just to roughly approximate the weight, are you saying that basically this piece, or whatever the third

is, I know it's not that end, but that proportional amount of the cigarette all goes into making the sidestream smoke and only a third goes into the mainstream smoke?
A What I was doing was giving you a rough generalization, and if we refer back to cigarette machine smoking, which I've done an awful lot of, and you calculate how much of the tobacco is burned during smolder periods versus how much is burned during puffing periods, it's roughly two-thirds and one-third.
Q Is it correct to say another way that a smoker only smokes a third of the cigarette actively?
A What I was doing was giving you a generalization.
Q I understand it's an approximation; is that correct, it's an approximation?
A I think that's an approximation.
Q And the other two-thirds goes into the environment?
A Goes to sidestream smoke, which then becomes environmental tobacco smoke.
Q Can we turn for a second to the Rodgman '62

document that you discussed with Mr. Wagner? Do you have that --
A Yes.
Q -- on the table there? Am I correct, Doctor, that you saw this document in connection with its production in a lawsuit a year or so ago, two years or whatever?
A It was produced in a litigation. When it was produced was the first time I had seen this.
Q And then were you subsequently asked by the lawyers to go back and try to get an explanation for the document?
A Well, let me make it clear. I was concerned about that sentence that we already spoke to. I was concerned about the tone and the

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way that was written. It's not, frankly, the experience that I've had at Reynolds. So I think I had my own personal concern. I think because it was produced in litigation, I was asked by attorneys to go back, thoroughly understand this, and critique this document.

Q Okay. And I think we've established you weren't at Reynolds in '62 when Dr. Rodgman

wrote this document; correct?

A No, I wasn't.

Q Now, according to this document, Dr. Rodgman certainly thought that the information contained in Reynolds' files, the unpublished information, about the carcinogenic and co-carcinogenic compounds should be published, didn't he?

A Where are you referring to, page 13?

Q Yes, sir.

A Well, he doesn't say that explicitly. What he says is some of the findings have been published; however, much data remain unpublished because they're concerned with carcinogenic or co-carcinogenic compounds or with patentable material.

And I've tried to make it clear what these references that he's referring to represent.

Q Yes, sir. But you know in your investigation, when you investigated the matter, you found out in your investigation, didn't you, that Dr. Rodgman wanted to publish this information?

A I think my experience with Dr. Rodgman is

he's, first of all, an excellent scientist. I think he does want to publish information.

Q And your investigation would have included reading back two pages on the document to page 15, wouldn't it?

A Okay.

Q Where Dr. Rodgman says, "It is recommended that data already available on physiologically active cigarette components, example, polycyclic hydrocarbons, phenols, be published." Clear as day, isn't it?

A That's exactly what he says.

Q And Dr. Rodgman goes on, "It is also recommended that analytical procedures concerning such components be published." He says that, doesn't he?

A That's exactly what it says. And as I've already tried to indicate, what this doesn't do is suggest that these -- that this information that he wants to publish wasn't out there in the scientific community anyway. Because it was, with the exceptions that I've already noted.

Q When Dr. Rodgman says, "It's recommended that analytical procedures concerning the

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components be published," he recommended that because, in some respects, Reynolds was ahead of the outside scientific community in its analytical procedures in the early '60s, wasn't it?

A I think in some respects we were ahead of others. In other respects we weren't. I think we have, at Reynolds, in my experience, published a variety of analytical methods over the years. In some cases we are ahead of others in the area. But we do publish analytical test methodologies. We also have published a large number of the known constituents in smoke.

Q In 1962 Reynolds hadn't, and Dr. Rodgman wanted them out, didn't he?

A Wanted them out?

Q Wanted them out in the published literature, the analytical techniques. It says that, doesn't it?

A Well, it says as you read it.

Q All right. Now, Dr. Rodgman also was concerned that if Reynolds didn't go ahead and publish this information and it was

discovered years later that it withheld the information, that that information could come back and hurt Reynolds, wasn't he? That was his concern.

A I think there was some tone in this document about that. However, that information was already published accept for cholanthrene and for eugenol and isoeugenol.

Q It wasn't published by Reynolds, was it?

A No, it was published by others.

Q Reynolds sat silent about the issue.

A And I think Dr. Rodgman wanted to publish analytical test methodologies, his precursor work, as well as some identification.

It's not a matter of if he had published that it would have changed the scientific understanding. Dr. Rodgman, in my opinion, is a perfectionist. I think he didn't -- he didn't assume that UV spectroscopy was a complete identification of each of the constituents that had already been reported in the literature. He liked to isolate, derivatize, and positively identify each of the series of polycyclic aromatic hydrocarbons. So I think there's a

difference in approach.

Would it have made a difference if Dr. Rodgman had published in 1962 all of the constituents that he had identified that were already known in the literature, would that have made a difference? My guess is probably not.

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Q Outside scientists had published some of these constituents. Reynolds internally had found the same constituents.
A Correct.
Q Reynolds at the same time is saying we don't believe cigarette smoking causes cancer in 1962; correct?
A Well, we could go back and look at specific documents.
Q Well, you've gone back and looked at documents and you've talked to old timers; you've testified to that before, haven't you? You've done that?
A There's a difference between, in my mind -- and I can only speak for myself and from my experience at Reynolds -- there's a difference between saying cigarette smoking does not cause cancer and between saying I

don't know whether cigarette smoking causes cancer. There's a difference.
Q And at the time, as far as you know, in 1962, Reynolds' position in 1962 is exactly the same as it is today in 1998.
A I don't --
Q Reynolds does not admit that cigarette smoking causes lung cancer.
A I don't know what Reynolds said in 1962 about causation. I do know that, like myself, many others at Reynolds are clear that this company, based on the scientific information, does not know whether cigarette smoking causes lung cancer. It may.
Q By the way, Dr. Townsend, in your research and review, did you read the entire document?
A I did. It's been a while back since I've read it but...
Q On page 13, Doctor, did you read below where Dr. Rodgman states the following, with respect to Reynolds' position in 1962 about causation: "If a company plead not guilty or not proven to the charge that cigarette smoke or one of its constituents is an

etiological factor in the causation of lung cancer or some other disease, can the company justifiably assume the position that publication of data pertaining to cigarette smoke composition or physiological properties should be withheld because such data might affect adversely the company's economic status when the company has already implied in its plea that no such etiologic effect exists"?
That's what Dr. Rodgman said, didn't he?
A You read that accurately.
Q All right. And Dr. Rodgman was saying how can we be pleading not guilty or lung cancer caused by cigarettes is not proven when

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we're withholding data.
A I don't think that's what he said. I think I know -- I can't get inside his head when he was writing this anymore than you can. I do know Dr. Rodgman fairly well. I know he -- it's important for him to publish information. I think he's published a lot of information over the years.
Q Let's talk about the publication of

information. There is a procedure in place at Reynolds to the present day, is there not, that no scientific article can be published unless it goes through lawyers' review.
A I think that's a mischaracterization of our --
Q You tell me what you think the procedure is.
A I'd be happy to. When a scientist produces a paper for possible publication, the scientist will then first get two independent scientists who have not worked directly in this area but know a lot about it. Or not worked directly on that project. Get two independent scientists within Reynolds to review the manuscript, to make sure it's scientifically and technically top quality and that the conclusions and methodology is the right approach, at least in the opinion of those reviewers.
Then it goes to a series of reviews. The entire manuscript goes to a series of reviews of others, including their division managers, their group leaders, the vice president in charge of their group. It also

goes to the vice president of scientific and regulatory affairs. It goes to also the head lawyer in research and development.
We have several lawyers attached to research and development; even though they were work in the legal department, they physically reside in our department. The head of that group, in fact, reviews the document as well. A number of reviews; the lawyer is one of them.
Q And the lawyers review the manuscripts, do they not, for litigation concerns as well as other concerns?
A I think the lawyers review all the manuscripts for a variety of reasons.
Q Does it include litigation concerns?
A It does include litigation concerns, as well as patent issues. Our lawyers, as you can imagine, are very close to many of the discussions on regulatory issues. They're expert in FTC regulations, for example, and others. So there are a variety of reasons.
Q Litigation concerns, regulatory concerns. Does that include dealings with groups like the FDA?

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A That's one. Dealings with the FTC, dealings with others.
Q Your company and the rest of the tobacco industry is fighting regulation by the FDA; correct?
A I don't think that's an exactly accurate picture. I think --
Q Do you want the FDA to regulate the cigarette industry?
A Well, I think, historically, my company, and myself included -- this is my personal opinion -- thinks that the FDA regulation of cigarettes is unnecessary and unneeded.
Q You don't want the FDA to regulate you.
A Please let me finish.
Q Yes, sir, I'm sorry.
A And I think that, however, as we all know, there are discussions going on in Congress and elsewhere --
Q No, sir, I don't want to get into those discussions elsewhere.
A You asked me, and I'm telling you.
MR. WESTBROOK: Your Honor, I think he's about to raise an issue --
MR. MOTLEY: Your Honor, may we

approach?
THE COURT: No. No. You asked him a question, let him finish his answer.
MR. WESTBROOK: I would be happy for him to say it, Your Honor, but I don't think he would want to say it.
THE COURT: Pardon me? I didn't hear what you said.
MR. WESTBROOK: Your honor, could I approach?
THE COURT: No.
Finish your answer.
Q Go ahead, Doctor, tell us what the concerns were, what the discussions are in the Congress.
THE COURT: Please let me instruct the witness. Finish your answer.
THE WITNESS: Yes, sir.
A What I'm trying to do is make it clear that in the past there are individuals, and in fact, the company has fought FDA regulation because they believe it doesn't make sense or is not the right thing to do.
I think, however, there are, as we all know, discussions going on in Congress and

elsewhere about possible settlements which would, in fact, ask FDA to regulate the industry.
So I think there are today people in RJ Reynolds who certainly want this settlement and are willing to accept FDA regulation as a result.

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Q Absent a settlement, your company's intention is to fight FDA regulation.
A I don't think that's fair at all.
Q Hasn't your company sued the FDA up in North Carolina to fight the regulation?
A We have. That's my understanding.
Q And that fight is going on, is it not, today as we speak?
A I think that things as we speak are extremely complicated. I think it's beyond my expertise. I was just telling you how I see things.
Q Now, Dr. Townsend, it's true, is it not, that in addition to lawyers reviewing the manuscripts at Reynolds, that you, on occasion, have groups of lawyers or paralegals come into your office and gather up all your files and take them out; isn't

that correct?
A That does happen often.
Q And, in fact, in your research and development department at Reynolds, you have somebody from the Womble Carlyle law firm, Mr. Furr's firm, who is there almost constantly, don't you?
A We have a paralegal from Womble Carlyle who goes around and gathers documents for document retention.
Q And, Doctor, you try to avoid talking to this Womble Carlyle person at your office, don't you?
A That's absolutely not true. Jay is a nice fellow and I like him. We do talk often.
Q Doctor, let me show you some prior sworn testimony you have given in another matter and ask you to read this question and answer, see if it refreshes your recollection.
A Yeah, I know. I just want to get the context of it, please.
Q Absolutely.
MR. WAGNER: Line and page, please, the deposition? Which one is it?

MR. WESTBROOK: Barnes, 486, 487.
A Okay. What's your question?
Q Did you testify under oath in a previous proceeding that, "Frankly, I prefer not to talk to him," referring to the same Jay?
The question: "Does he --" referring to Jay, "go to -- is he in the Reynolds telephone directory as a Reynolds employee?
"Answer: I never tried to look him up. Frankly, I prefer not to talk to him."
Did you say it, sir? Did you say it?
A Well, that's what it says here. I can tell you that Jay is a nice fellow. I talk to him.
Q Dr. Townsend, are you aware of a lawyer named Ed Jacob who represented Reynolds?

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A I've heard the name. Never met him.
Q And you know your chief executive officer, Mr. Goldstone?
A I've never met him. I've talked to him.
Q Have you talked to Mr. Goldstone about his views of Mr. Jacob's representation of Reynolds and Mr. Jacob's conduct?
A No, sir.
MR. WAGNER: Objection, Your Honor,

relevancy.
MR. WESTBROOK: Your Honor, there is already testimony in the record from Mr. Goldstone about Mr. Jacob.
MR. WAGNER: It's improper, first of all, to ask the witness about the testimony of another witness, Your Honor.
MR. WESTBROOK: Well, I didn't ask him about the testimony. I asked him about conversations he had with Mr. Goldstone after he said he talked to Mr. Goldstone.
THE COURT: Let me hear your question again.
MR. WESTBROOK: I'm past the area, Your Honor. He said he didn't talk to Mr. Goldstone about the area.
THE COURT: All right.
MR. WESTBROOK: Your Honor, I think I have a five-minute area.
Q Dr. Townsend, you said you were active in a group called CORESTA on direct examination?
A That's correct.
Q Is CORESTA a scientific group?
A It's a group of scientists from the tobacco industry and from supplier industries from

around the world. CORESTA provides an opportunity for scientific exchange, that is for presenting papers, technical papers. It also provides the structure for establishing standard test methods that we can use in our industry.
Q And do scientists from the other tobacco companies get involved in CORESTA meetings?
A Yes.
Q Did I hear you say that you're a vice president of some committee in CORESTA?
A What I said was I'm currently president of the technology group which is one of the major groups under CORESTA.
I'm also vice president of the scientific commission, which is the group of scientists who direct the scientific activities of CORESTA.
Q All right. And did you mention on direct that CORESTA publishes some publications or prepares some papers for publication when reflecting your work?
A CORESTA, actually, when we develop standardized test methods, will publish recommended test methods which usually go to

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ISO, the International Standards Organization, for adoption by them. There are also CORESTA bulletins published, which include either abstracts or, in some cases, full copies of scientific papers that are presented.

Q Who from Philip Morris do you call to mind as being involved in CORESTA?

A Well, I think there are several. Dr. Jerry Whidby is, of course, one, a person I've known for a number of years. And --

Q That's fine. How about from Brown & Williamson? Who from Brown & Williamson do you recall being involved in CORESTA?

A I don't know him very well, but Dr. Roger Black has also served on CORESTA.

Q How about from Lorillard?

A From Lorillard Dr. Vella Norman is the first that comes to mind.

Q And do the CORESTA publications and papers concern science, tobacco science generally?

A Well, that's my estimate of it, yes.

Q Do they concern legal matters?

A No. My estimate is that CORESTA is a scientific organization, and it doesn't

concern legal issues.

Q Then why would tobacco company scientists be wanting outside lawyers to look at their papers before they're published?

A I think anytime -- and let me use Reynolds as an example. Anytime a scientist at Reynolds wants to present or publish a paper through CORESTA -- and we've had a variety of scientists present papers at CORESTA -- our internal lawyers will review, as do our management, group leaders and peers, review every manuscript, as we've already discussed.

Q So the lawyers review the CORESTA papers prepared by your scientists as well as your internally prepared papers; is that a fair summary?

A No. The approval or review process that I've already described fits everything, whether it's a published paper in the scientific literature or whether it's a presentation at CORESTA or a presentation at the American Chemical Society, we go through the same review. And the review includes all the individuals I've already listed, it

includes proprietary issues, as well as regulatory issues, as well as litigation concerns.

Q All right. So the lawyers' review includes papers, presentations?

A Papers published in scientific journals, presentations of scientific information.

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Q Did you mention one other category? Your presentations and your papers go through the review, including lawyers. Is there another category of things that go through the lawyer review?
A All scientific information that goes outside the company is reviewed by management and by peers and by lawyers.
Q Okay. Thank you.
MR. WESTBROOK: Your Honor, I'm ready to move on.
THE COURT: All right. I think we'll take the noon break, Doctor. You may step down. Break until 1 p.m.
(Standard admonition)
MR. CASSELL: All rise.
(A lunch recess was taken.)

MR. CASSELL: All rise.
THE COURT: Be seated. Jury back in its entirety.
Doctor, have a seat, please. Would you again tell the jury your name, please.
THE WITNESS: Yes, my name is David Townsend.
THE COURT: Thank you.
Mr. Westbrook.
MR. WESTBROOK: Thank you, Your Honor.
BY MR. WESTBROOK:
Q Dr. Townsend, am I correct that except for three years out of -- after college working for a chemical company, your entire professional career has been spent working for RJ Reynolds?
A That's correct. I joined RJ Reynolds in 1977, had a three-year period of working for a chemical company before that.
Q And when you joined Reynolds in 1977, you didn't know anything about cigarettes, did you?
A Well, I would say from a chemical or physical point of view, I really certainly

didn't know much about cigarettes. I didn't know much about combustion, filters and the like. I did have a general understanding of cigarettes and probably similar to what many consumers would have.
Q Did you know what the additives were in cigarettes?
A At the time I joined RJ Reynolds?
Q Yes.
A No.
Q Did you know what the FTC method for testing tar and nicotine was?
A At the day I walked into RJ Reynolds?
Q Yes, sir.
A I knew that -- I'm trying my best to recall. I think I was aware that there was a testing

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protocol or a testing method, that there were tar and nicotine numbers. I didn't know what that protocol was.
Q All right. Did you know what reconstituted tobacco was?
A I can't say that I did, no.
Q Did you know what made up tar in cigarettes?
A I can't say that I did. Are you talking about chemical composition? I've already

said I didn't know the day I walked in much about the chemistry o physics of cigarettes.
Q You didn't know anything, I suppose, about tobacco-specific nitrosamines in cigarettes?
A No, I can't say that I did.
Q And you certainly didn't know whether sidestream smoke had the same or different components than mainstream smoke back in those days, did you?
A Well, I've already said I didn't know much or didn't know anything about the chemistry or physics of cigarettes, so I think that's fair.
Q You're now a vice president at RJ Reynolds?
A That's correct.
Q And you're vice president of product development?
A Product development and assessment. I have more than just product development responsibility.
Q Is the only product that you work on developing cigarettes?
A I spend 100 percent of my time working on cigarettes, either from a product development standpoint, from analytical

chemistry research or from routine analytical support.
Q Is RJ Reynolds Tobacco Company's entire business selling cigarettes?
A Certainly the focus of our business is selling cigarettes. I think in the course of that, our research and development efforts sometimes learn things that are not directly focused on the cigarette business. So I would say that there is some basic research that probably doesn't deal directly with cigarettes.
Q My question wasn't clear enough. Is the only product that RJ Reynolds Tobacco Company sells cigarettes?
A The only consumer product that RJ Reynolds sells today, as we speak, is cigarettes.
Q If everybody stopped smoking tomorrow, RJ Reynolds would be out of business; right?
A I think that's a fair assumption.
Q Your company wants people to continue smoking.
A Well, I think our company certainly wants to sell cigarettes to those who want to buy them.

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Q And if every American decided to smoke, that would be okay with you, wouldn't it?
A I think that would be each individual smoker's choice whether they want to, and our situation is that most people in this country don't smoke.
Q But if each person decided to smoke, that would be okay with you; wouldn't it?
A Again, that's their personal choice. We certainly want to sell cigarettes. There's no question about that.
Q And you own some stock in Reynolds?
A I own some.
Q Do you own stock in any other tobacco companies?
A I have a small amount of stock from Philip Morris.
Q You've testified, I think you said on direct, for Reynolds at five previous trials?
A That's correct.
Q And in at least one of those previous trials, Mr. Wagner was the attorney for the tobacco company who examined you down in Indianapolis; do you remember that?

A Yes, sir.
Q And Mr. Ohlemeyer was at that trial as well?
A I believe he was.
Q And I was following along a bit on your testimony today and reading your testimony down in Indianapolis. And would it surprise you that the questions and answers, with some variations, followed along pretty well with the script that was used down in Indianapolis?
A Well, I don't know about the terminology of script. I think the testimony that I've provided in all five of those trials, not just the Rogers trial, is actually very similar because it is a historical account and perspective of what we've done at RJ Reynolds, and to a degree the rest of the industry, in cigarette design to address smoking and health issues. That testimony hasn't changed because that's what has happened.
Q And is it true, I noticed that the corners are starting to become weathered on some of these charts, don't you use pretty much the same basic charts when you come to these

trials?
A For the most part. Most of those charts are used in the various trials. They are a bit shop worn. There has been a lot of litigation.
Q Am I correct Dr. Rodgman, who we spoke about earlier, asked you to become Reynolds'

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witness on cigarette design?
A He was the first person who approached me a number of years ago and explored that as a possibility.
Q And in preparing to testify, I think you said that you looked at internal reports at Reynolds and you spoke with some people at Reynolds?
A Well, I think that's been the nature of my job all along, not just getting ready for litigation. I certainly have had to look at many, many documents from RJ Reynolds, their internal documents; I've looked at the public literature, publicly available literature, the scientific information; I've looked at presentations; I've talked with other scientists. I mean, that's the nature of my job.

Q And as part of your job, I think in connection with the fire-safe cigarette, am I correct that you had a day or day and a half of media training?
A Well, yes, I have had, actually, as I recall, two sessions of media training, because the cigarette fire safety issue had generated a lot of media attention. I'm certainly not an expert in the media or public relations. But we expected a lot of technical questions about fire-safe cigarettes, so I did receive, as I recall, two separate sessions of media training.
Q And in those sessions, you were videotaped giving some answers to mock questions and then you looked at the videotape to see how you did?
A That was a portion of it. It wasn't a pretty sight.
Q And I think one of the trials you said you testified about was the Connor trial back in April of 1997?
A That's correct.
Q And after you testified in that case, sir, you got a call from the chief executive

officer of RJ Reynolds, Mr. Goldstone, to thank you for your testimony?
A Mr. Goldstone did call me, I believe that was the trial that he called me after it was over.
Q A few months afterwards, sir, did there come a time in your career that you were promoted then to vice president?
A I was promoted to vice president in July of 1997.
Q And you didn't mention it on direct, but did you also work for the Liggett & Myers Company during, I guess it was a summer between college?
A Summer of 1969 I just finished my undergraduate degree at Chapel Hill and

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needed a summer job very badly. I went to Durham, knocked on the door of Liggett & Myers. They hired me as a summer student, a summer intern essentially working as assistant lab technician.

Q And in your current position, do you try to stay current with Liggett's tobacco products and what they're doing as well in the industry?

A Well, I certainly try to keep up with what all of our competitors are doing in the marketplace.

Q And in the course of keeping up, have you become aware that the president of Liggett, Mr. LeBow, has admitted in his view that cigarette smoking causes cancer?

MR. WAGNER: Objection, Your Honor, relevancy, asking this witness to comment upon testimony of somebody else.

THE COURT: He can answer that.

A I'm generally aware of that.

Q Dr. Townsend, you had a lot of charts, and you were, by my count, about three hours on direct, and we're not going to look at all your charts, I guarantee, but I wanted to talk about a few of the charts that struck me as you went along.

The first one was this quote from Dr. Wynder in 1954 in the Connecticut State Medical Journal about mouse skin painting. Do you remember talking about that one?

A I do.

Q Do you have that article with you, sir, the whole article?

A Not with me.

Q Let's see if I can help us out. I have one so I'm doing a little better than you, Doctor. I have a small version of this so we can look at what you quoted. By the way, did you prepare these quotes, or did somebody else do it?

A I directed the preparation of all those charts.

Q Okay. So this quote is something you selected out of a document?

A I think together with a number of people I selected that, yes.

Q Were lawyers involved in that group?

A For this particular document, I believe so.

Q Okay. Let's see if we can --

Now, your quote about mouse skin data comes from page 327. Have I lined up the present mouse skin data with the present mouse skin data?

A It appears so.

Q Now, the last sentence -- and maybe we can just put this up.

MR. WAGNER: Do you have a copy of that, Ed?

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MR. WESTBROOK: I have just this article.

Q So the jury can see it, the last sentence -- here is the small one, Doctor, so you can follow along. The last sentence of your excerpt says, "The mouse skin test cannot give definitive proof for a human carcinogen," and then there is four dots indicating you left something out; right?

A That's correct.

Q Okay. And what you left out was the mouse skin test cannot give definitive proof for a human carcinogen, although it has long been used as a reliable tool for testing of carcinogenic materials.

A I think that's a fair statement.

Q Did you actually have this article when you made the selection of that phrase that you put up on the board?

A I can't remember. I have been through that article, and I have a copy of it in my office.

Q And you're aware that on page 323, a few pages before you quoted that phrase, the same Dr. Wynder states back here in 1954, "A

positive association between smoking and lung cancer has now been shown in 12 recent separate studies covering more than 6,000 lung cancer patients."

Do you remember that statement in the article, sir?

A I don't remember that, but I see it as you read it.

Q And on the next column over, "The New England Journal of Medicine in a recent editorial considered present evidence of association between cigarette smoking and lung cancer so strong as to be considered proof within the everyday meaning of the word."

Do you see that, sir?

A I see it.

Q You obviously disagree with what was stated in this article in 1954.

A Is that a question?

Q Yes, sir.

A May I see that then. No. I wouldn't say that I disagree with a lot of this in here. I don't think I necessarily --

Q No, sir. I'm asking about the statement I

read. Do you disagree with that statement?

A Let's go back through each of those statements that you read.

Q All right.

A Let's start back with the one that I excerpted. Page 327.

Q There you go.

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A Okay. And Dr. Wynder says, "The mouse skin test cannot give definitive proof for a human carcinogen." Which is the same thing that the Tobacco Working Group and National Cancer Institute agreed in the mid '60s to late '70s. They did use it as a screening tool and it was available for that.

Then he goes on to say, "Although it has long been used as a reliable tool for testing of carcinogenic materials." I do agree with that, because scientists had to use mouse skin painting as a test for carcinogenicty for pure compounds.

And if you remember yesterday, I talked about one of the reasons that benzpyrene was looked at as one of the original constituents of interest in smoke was because it was thought to be a carcinogen

under certain conditions. That was from mouse skin painting studies. Where they had taken pure benzpyrene and actually painted the backs of mice and seen excess tumors. So it has been a reliable tool for testing of carcinogenic materials at certain dose levels.

Q Let's look at the statement about the New England Journal of Medicine.

A It says the next place -- I was getting to each one of them. The next place you referred to it says, "The New England Journal of Medicine in a recent editorial considered present evidence of an association between cigarette smoking and lung cancer so strong as to be considered proof within the everyday meaning of the word."

I think that statement is consistent with probably what most people have concluded, certainly Professor Wynder has concluded that, that the epidemiology is so strong, that must be proof.

I don't think that fits the classical, and I'm not an expert in this area, but I

don't think it fits the classical demonstration of causation because most people in settings other than tobacco would look to is there an animal model that demonstrates, to use our example, tumors on inhalation? Is there also a mechanism known of how that occurs before somebody will arrive at causation?

But most people in this country, frankly, have considered the epidemiology so strong that they will assume that it provides proof.

Q And you disagree -- excuse me. Before we go on. Do you disagree with that statement made 44 years ago?

A I've already made it clear what I believe,

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and it is that I don't know that cigarette smoking causes cancer for the exact reasons that I just enumerated; the lack of animal model, the lack of mechanism. But I do think that it is clearly a risk factor for a number of diseases and it may cause those diseases. I don't know.

Now, I'll turn to the third section you looked at. It says, "A positive association

between smoking and lung cancer has now been shown in 12 recent separate studies covering more than 6,000 lung cancer patients."

I think that's a fair statement, because the epidemiology is there. The epidemiology is strong. I have not questioned that at all, and I don't think anyone does.

Q All right, sir. Thank you, sir.

Now, you referred on several occasions to Dr. Wynder's statements in a Reader's Digest article. Do you recall doing that, sir?

A Yes, I do.

Q Do you have that Reader's Digest article with you?

A No, I didn't bring anything with me other than the charts.

Q By the way, in your box do you have any articles at all that were on these charts, so I don't have to keep asking the question?

A In the box I have some Eclipse cigarettes, which I had intended to show to the jury and in the flurry of everything didn't. There's also my curriculum vitae. I do not have

these articles.

Q Okay. Let me hand you the Reader's Digest article dated in July '57 identified as Ness Motley Exhibit 15660. And ask you if this is the article that you had reference to during your direct testimony.

A The title of this article is "Wanted and Available Filter Tips That Really Filter." It's Reader's Digest, July 1957. This is the article I referred to when I talked about Dr. Wynder calling for tar reduction.

Q Thank you, sir.

MR. WESTBROOK: Your Honor, we would move Exhibit 15660 into evidence.

THE COURT: For what purpose, Counselor?

MR. WESTBROOK: Your Honor, it is an ancient document. It contains the information that Dr. Townsend quoted extensively from under his direct examination. I would like to ask him about the article.

MR. WAGNER: We'll object to that, Your Honor, it's hearsay, irrelevant.

MR. WESTBROOK: It's not hearsay,

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Your Honor. It's 40 something years old.
THE COURT: If you're offering it to evaluate his opinion, you may do that.
MR. WESTBROOK: Yes, Your Honor.
THE COURT: This is being offered, ladies and gentlemen, as I told you yesterday, not as substantive evidence on the principal issue involved, but only as an aid in evaluating his opinion. So I'll admit it on that basis, 15660 on a limited basis.
(Plaintiffs' Exhibit(s) 15660 received in evidence.)
MR. WESTBROOK: Your Honor, may I hand copies to the bailiff to be distributed to the jury?
THE COURT: All right.

BY MR. WESTBROOK:

Q Dr. Townsend, is the statement that you referred to on direct examination contained in this article?

A The statement I referred to in reference to Dr. Wynder is contained in this article on page 44, right-hand column, roughly middle of the column.

Q And did you read this article in preparing to testify about Dr. Wynder's statements on direct testimony?

A I have read this article numerous times. It's been quite a while since I've read it, however.

Q Take a look a page before the quotation that you gave us from Dr. Wynder, the first paragraph which states, "Secrecy is the rule in the cigarette industry. Research is guarded jealously. Developments immediately become highly classified trade secrets. What goes into or comes out of a cigarette is considered nobody's business but the manufacturer's. Questioned about such matters, the average tobacco man either freezes up or explodes."
Now, in the course of doing your historical research, did you go back to see what the attitude of the cigarette industry was back in those days toward revealing what goes into or comes out of a cigarette?

A Well, I got a glimpse at some things from my vantage point of reading internal documents, reading external documents. And my sense is

that certainly there were a number of things that were regarded as trade secrets. For example, the additive systems that were used in cigarettes. I think that the cigarette construction variables certainly were trade secrets as well.
There was an intense competition in the

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early filter development in the time of the early filter development, an intense competition. Everybody was trying to outdo one another.

I don't think that everything, as this suggests, I don't think everything quickly became trade secrets. In fact, I think I already said that the CEO of Reynolds testified before Congress about our use of reconstituted tobacco. And I certainly don't agree that questioned about such matters, the average tobacco man freezes up or explodes. I don't think I've done either.

Q In addition to quoting Dr. Wynder, on page 48 the article also quotes the study group on smoking and health.

A I'm sorry, which page?

Q Page 48, the first column, sir, down toward the lower left-hand side.

A 48, first column.

Q Lower portion.

A Okay.

Q It says, "Study group on smoking and health which declared 'scientific evidence establishes beyond reasonable doubt that cigarette smoking is a causative factor in lung cancer.'"

Is that a statement that you've --

MR. WAGNER: Excuse me, would you read the rest of it, please.

Q Yes, sir. "...in lung cancer. Also stated that in the few reports available, there is no convincing biological or clinical evidence to indicate that smoking, per se, has a causative role in cardiovascular disease."

Do you see where I was reading from, Doctor?

A I see where you're reading.

Q Have you ever excerpted the statement from the study group on smoking and health that scientific evidence establishes beyond a

reasonable doubt that cigarette smoking is a causative factor for lung cancer in any of your charts?

A No, I haven't.

Q Doctor, on the last page, page 49, the right-hand column in the middle, the statement "Tobacco products are directly linked to the public health."

Do you agree with that?

A I think tobacco products are clearly a risk factor for a number of diseases. In that context, yes, I agree.

Q And it goes on, "And the tobacco industry has a long record of deceptive or irresponsible advertising."

In your research going back into

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Reynolds' records, did you see confirmation that Reynolds had put out deceptive advertising in the 1950s, sir?

A I haven't been back through all of Reynolds' advertising, nor do I care to. It's not my job. However, what I have seen doesn't come across to me, based on what I know about cigarettes and cigarette design, as deceptive or irresponsible. That's just not

my overall take on it.

Q In connection with the tar and nicotine numbers, numbers similar to what you've shown on your charts, do you recall from your research into the Reynolds' archives and talking with people that there was a so-called tar derby, where the companies were advertising different tar levels and making health claims based on those tar levels?

A Well, I don't know about health claims. I think back beginning in the '50s, continuing on into the '60s, there certainly was a tar derby. There was a mad competitive race toward providing lower tar products that had consumer acceptance to the smokers, because smokers wanted those kind of products. So there, indeed, was a tar derby. It was highly competitive.

I certainly don't recall any health claims, you know. It's not my area. I just don't know.

Q Now, in connection with Dr. Wynder, because you talked about Dr. Wynder so much on direct, going back into your research into

the tobacco industry records and talking with the old-timers, did you become aware that one of the industry's first reactions to Dr. Wynder was to consider whether the industry should try to smear and belittle him?

A No, I'm not aware of that at all. I know Dr. Wynder in my estimation is an excellent scientist.

Q Let me show you a document that's in evidence, Your Honor. This is Exhibit 3793.

THE COURT: All right. Thank you.

Q Dr. Townsend, I'd like to direct your attention to page 6 of this document which is in evidence.

MR. WAGNER: Well, Judge, I object to questioning the witness about a document that he can't identify and has no knowledge of.

MR. MOTLEY: Your Honor --

THE COURT: I'm not sure he's said that yet.

MR. MOTLEY: Also, Your Honor, he's testified that he's gone back and looked at all these historical documents. It's a fair

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question to see if that review was selective.

THE COURT: All right. Go ahead, Mr. Westbrook.

MR. WESTBROOK: Thank you.

BY MR. WESTBROOK:

Q Dr. Townsend, on page 6, directing your attention to problem 4, which states, "We must early decide our own attitude toward the findings of men like Wynder, Rhoades, Ochner, et al. We have a choice as previously indicated of A, smearing and belittling them; B, trying to overwhelm them with mass publication of the opposed viewpoints of other specialists; C, debating them in the public arena; or D, we can determine to raise the issue far above them so that they are hardly even mentioned and then we can make our real case."

Now, Doctor, in your review of the historical records that you went back and looked at and in talking with the old-timers, did anybody ever tell you that one of the tobacco industry's considered options with respect to Dr. Wynder was to

smear and belittle him?

MR. WAGNER: Objection, Your Honor, to questioning the witness about a document he can't identify, didn't author, it's not a Reynolds document.

MR. WESTBROOK: Your Honor, it's a historical record.

THE COURT: Overruled.

You can answer that, Doctor.

A First of all, I have never seen this document. I don't know what it's from. I don't know what the planning committee is that it's referring to. I can only try to interpret it as based on what I see here.

Q The question, sir, was -- let me just ask my question.

A Please.

Q My question is: In your research and review and talking with the old-timers, did anyone ever tell you that one of the industry's considered options with respect to Dr. Wynder, the first one listed was smearing and belittling them. Did you ever hear that that was one of the options the industry talked about?

A I've never heard that, nor read that in any document. And if that was, in fact, a choice that was considered, at least my estimation is it wasn't taken. Because we've looked to Dr. Wynder for his scientific theories. Many things that Dr. Wynder says or believes, we don't

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necessarily believe as scientists. However, we certainly haven't tried to smear him in my estimation. And, in fact, I've used his name quite a lot here in the past two days.

Q I heard that.

Now, how did the tobacco industry decide when you were going to follow Dr. Wynder's suggestions and when you were going to dismiss them? Do you know?

A From a cigarette design point of view, and that's what I can speak to, I think we've considered -- we've considered really all of the theories or hypotheses about what constituents in smoke may be the problem.

Dr. Wynder, of course, earlier proposed benzo(a)pyrene was the problem. We also, and a number of Reynolds' employees, including Dr. Senkus and Rodgman, had a lot

of interaction with Wynder back in those days. So I think, in general, if a theory made sense or could be possible, RJ Reynolds, and I believe our competitors, addressed those.

Q I believe you testified on direct that you were aware from some patent reviews or some published articles of what your competitors were doing with respect to cigarettes of reduced yields or reduced tar and nicotine yields. Do you remember testifying about that subject?

A Well, I think I testified in general we try to keep up with what our competitors are doing. And one way to do that is by looking at the patent literature, looking at their scientific presentations and publications, by taking their products off the market, dissecting them and trying to reverse engineer, understand how they construct their products.

Do we have a clear 100 percent picture of what our competition is up to? Of course not. But we do have -- we try to get the best idea of what they're up to as we can.

Q Doctor, are you appearing here today on behalf of only Reynolds or on behalf of the other companies as well?

MR. WAGNER: Objection, Your Honor.

MR. WESTBROOK: I'd like to know because it will affect the scope of my cross-examination how much he's representing what the other companies did or didn't do and who he is speaking for.

MR. WAGNER: I don't think that's a fair question to ask the witness.

MR. WESTBROOK: I think it's basic.

MR. MOTLEY: He testified he was speaking for all of them.

Q Maybe I can rephrase it, Doctor.

THE COURT: While I'm thinking, go

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ahead and rephrase it.
Q Dr. Townsend, in giving your opinions today on what the cigarette industry was doing or not doing, were you speaking on behalf of the other companies or were you speaking just on behalf of Reynolds?
THE COURT: He can answer that.
A Well, frankly, of course what I know most thoroughly is what's happened at Reynolds.

I do know some of what's happened at my competitors.
And I think, and it may have been yesterday I testified to the fact that I know, in particular, research at RJ Reynolds about cigarette design as it addresses smoking and health issues. And I know, in general, or more general, what the rest of the industry has been up to in these regards.
But, certainly, most particularly for RJ Reynolds but, generally, for the rest of the industry.
Q Do you know at any particular point in time what cigarette designs the other companies had in their research departments that they didn't introduce into the commercial market?
A There have been occasion where we've intercepted test products and consumer tests from other companies. Particularly unusual filters, unusual filter designs, that sort of thing.
Also, in the development of low sidestream products that might have reduced ETS as well, we've intercepted products from

our competitors using unconventional cigarette papers to try to accomplish that. We've tried to dissect and understand the chemical makeup, the physical properties of those unconventional papers.
So we do, on occasion, get lucky and find out some of the things that our competitors are up to before they hit the marketplace.
Q But other than that, I take it you haven't had any general access in preparing for your testimony to the other defendants' research files on their cigarette designs, have you?
A I think that's absolutely correct. This is a highly competitive industry, and I don't expect Philip Morris or Brown & Williamson or anyone to allow me into their research department.
Q Doctor, do you have any knowledge either from what you picked up or talking with other scientists of whether the Philip Morris Company kept a safer cigarette design on the shelf, so to speak, and didn't introduce it into the market?
A I don't know about on the shelf. I have,

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for a variety of reasons, I believe that Philip Morris was, in fact, developing a variety of products along the lines of Premier, that they evaluated a number of different approaches to a Premier-like product. I know that those have not shown up in the market. I don't know why. I don't know whether it's consumer acceptance or technical issues they ran into. Or whether, as you suggest, they were successful and put it on the shelf. I have no idea. I do know that technical work was underway.

I also know that technical work has been underway at Philip Morris on a number of other approaches. And one that Philip Morris has recently announced is a battery-powered smoking article.

Q Now, you presented a number of charts to the jury showing tar and nicotine levels of various cigarettes, and I'm just holding one up, I guess it's the Camel chart for comparative purposes. And I would like to talk to you a little bit about these numbers and where they come from.

First of all, I think you mentioned on direct, Doctor, that if this chart had been extended out another 12 years to the present, there basically has been no further reduction in tar and nicotine in the last 10 or 15 years, has there?

A Well, that's not a complete picture. What we're doing is looking at one particular brand style, in this case Camel non-filter. I showed you also a chart for Camel -- I mean, sorry, for Winston Red or Winston filtered product. And yes, you're actually right, that the tar level has leveled out and stayed relatively constant over the last 10 to 15 years.

What has happened, though, is we've introduced additional brand styles like Camel Filter, Camel Lights, Camel Ultra Lights, that give a range of products with different tar yields. But for the specific brand that's we've charted, you're absolutely right, the tar level has remained about constant over the last 10 to 15 years.

Q Now, not just for the specific brand styles, isn't it true that for the U.S. cigarette

market as a whole, the sales weighted tar and nicotine levels have flattened out, they have not continued to drop?

A That's absolutely correct. And I think one of the charts that I had suggested that. I may have spoken to it in testimony; I can't remember.

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But it is clear, from my evaluation of sales weighted tar and nicotine levels that the sales weighted average is not continuing to go down. Which then leads, of course, us at R & D to devise alternate directions for product development. And I think there is three directions for product development.

The first is to try to make better tasting ultra low tar products. A real tough chore. We've tried and worked hard at it and we're continuing. But if we can make better tasting, more consumer-acceptable ultra low tar products, that would drive the sales weighted average further down.

Another approach that we have taken is radical designs like Premier and Eclipse to try to get the overall level of combustion in tar way down, but try to maintain some

consumer acceptance. That's the second approach.

The third approach is we've come back at Reynolds and intensified our effort trying to look at selective reduction of not one compound or one class of compounds but as many compounds as we can all at one time through multiple selective reduction techniques. And we've had some reasonable success in the last couple of years affecting a selective reduction of many compounds; not just one silver bullet, if you will.

Q Now, let's talk about these numbers. These numbers are derived, are they not, from a machine testing procedure?

A They are.

Q Okay.

MR. WESTBROOK: And if we can, Your Honor, may I take a minute with the Doctor and demonstrate to the jury something that may help us?

THE COURT: Go ahead.

Q Doctor, as I understand the machine testing procedure, the machine is set up to take a

puff of a certain volume, 35 milliliters, once a minute; correct?

A That's correct.

Q Okay. And then it takes another puff until the cigarette is smoked down to a certain length and then the numbers are brought out and that's the number you get, correct, basically? Simplified?

A That's simplified.

Q What I want to do is just -- do you have a watch with you, sir?

A Yes.

Q Just so we get an idea, I want to take one minute. If you would tell me to puff, and I'll puff like the machine puffs for two seconds -- you puff for two seconds with the

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machine; right?
A That's what you left out of the first part.
Q You would say puff, I'll puff for two seconds, and then count and tell me when to puff again. You say puff and I'll start.
A Puff. You're now 30 seconds into it. Puff.
Q Okay. And that's how the machine smokes the cigarettes; correct?
A The machine --

Q Timewise.
A That's the interval.
Q Okay. Now, and then those numbers after -- I know that there's calculating and there's a number of cigarettes that are done, but that's the interval. And then these -- that's how these numbers are generated. They're generated off a machine that puffs at that interval; correct?
A Those numbers are generated off the FTC smoking protocol which includes, as you said, a 35-cc puff volume of two-second duration taken once per minute and there are detailed prescriptions on what the machine has to be, how it's constructed, what kind of Cambridge filter mat is used and collected. There are conditioning requirements. It's an extensive protocol.
Q Okay. And nobody smokes like the machine, do they?
A In general, is that your question? In general?
Q Yes.
A I think it's fair to say that the machine smoking method is a laboratory method. And

individuals smoke cigarettes in highly variable ways. And, in fact, a single smoker certainly smokes differently, depending on whether it's the first of the cigarette or even the last puff of the cigarette; the puffs are all different. I think from the first of the day to the end of the day smokers certainly smoke differently. Extreme variation in how people smoke.
Q And actually the machine takes one puff a minute, more likely -- and I know there's no average smoker -- but the average of the data shows that the more likely interval is real life is probably two puffs a minute, isn't it?
A You're absolutely right; there is no average smoker. If you look at large groups of smokers and you try to measure how they puff, I think the consistent data in the literature on smoking behavior would suggest it might be closer to two puffs per minute.
Q And as a rough approximation, if I puff twice as frequently as the machine, my tar level would be twice as high as the machine

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at the same volume and holding everything else the same.
A To a first approximation.
Q And the machine takes in 35 milliliters; is that correct?
A The FTC prescription is for 35-milliliter puff.
Q And again, there's no average smoker, but the average of the data indicates that people probably take in closer to what, 50 to 60 milliliters?
A Well, I really don't agree with that. I think if --
Q Would you agree with 50?
A Again, there is no average smoker. Smokers are highly variable. But if you look at the bulk of the literature, I would guess maybe somewhere between -- somewhere in the neighborhood of 45 cc's or milliliters.
Q 45, okay. And, again, if I'm taking in more smoke than the machine, my tar number is going to be higher than the machine indicates; correct?
A In general, to a first approximation, if you increase the puff volume, everything else

the same, the tar yield would be higher.
Q And Reynolds has looked at these issues in some detail, hasn't it?
A Well, we've done experiments trying to understand how people smoke. And we've also done experiments trying to understand how puffing conditions affect yields.
Q Now, you mentioned, Doctor, Alan Rodgman. Dr. Rodgman is a scientist -- was a scientist at Reynolds. I think he's now a consultant to the Womble Carlyle law firm, isn't he?
A I believe he's still a consultant.
Q And you have great respect for Dr. Rodgman, don't you, sir?
A I've worked a lot with Dr. Rodgman. I think he's an excellent scientist. He and I have gotten into disagreements and arguments, but I respect the man, certainly.
Q Let me show you a document offered by Dr. Rodgman which I believe you have some familiarity with, sir.
Dr. Townsend, you've seen this document before, haven't you?
A Yes, I have. I've seen it. It's been quite

a while ago, actually.
Q Dr. Rodgman gave you a copy of this document for your own use, didn't he?
A I believe that's correct.
Q And you circulated this document to a number of scientists interested in the information within Reynolds.

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A I believe that's correct also.
Q And Reynolds scientists have used this document for their own education?
A That's fair.
Q And you believe this document is a useful summary concerning the FTC method.
A I believe that this is a useful historical summary of the FTC method in general.
MR. WESTBROOK: Your Honor, we would move the August 30, 1994 document by Dr. Rodgman entitled "FTC Smoking Method Used for Tar and Nicotine Data" into evidence as the next exhibit number.
MR. WAGNER: Judge, I haven't had a chance to examine it, since it's 60 pages long, but I don't see what relevancy it has to this witness' testimony.
MR. MOTLEY: He testified about it

on direct.
MR. WAGNER: He never testified at all on direct to the FTC method.
THE COURT: Do you want some more time to look at it, Counselor?
MR. WAGNER: I might be assisted if somebody would tell me what relevancy it has to anything.
MR. MOTLEY: I'll be glad to tell him, Your Honor, if you'd like.
THE COURT: Whoever.
MR. MOTLEY: If you want me to help him out?
THE COURT: How is it relevant?
MR. WESTBROOK: Your Honor, it's relevant because it concerns the method by which this chart is derived.
MR. WAGNER: Then what I would suggest is that they lay a foundation, Your Honor.
MR. WESTBROOK: Your Honor, I just did.
THE COURT: I think they've done that. 106 will be admitted.
(Plaintiffs' Exhibit(s) 106 received in

evidence.)
MR. WESTBROOK: Thank you, Your Honor.
A Actually, my copy is missing the first page of the contents.
Q Yes, sir. And the copy that you had several years ago was missing the first page, the "I", wasn't it?
A Is that right? I don't remember.
Q The document was precisely as you had it at the time.
A Okay.
Q All right. Now, let's turn, if we would, to page IV, where Dr. Rodgman discusses the FTC smoking parameters. And Doctor, just to orient ourselves, the parameters he's

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talking about are the parameters used to derive these numbers on the chart that you've put up here for the jury; correct?
A That's correct. These are parameters for FTC smoking.
Q And Dr. Rodgman notes that under the major smoking parameters of puff volume, puff duration, and puff frequency, the numbers the machine -- that's used for the machine

to derive these numbers, that the human smoker would not necessarily agree with any of those variables, but the human smoker's condition would be variable dependent on individual smoker; correct?
A That's what it says and that's what I believe as well.
Q Now, in Dr. Rodgman's review he discusses work done at Reynolds to determine, if we were to look instead of at the machine, if we were to look at more realistic conditions, what are the tar and nicotine levels going to be.
Do you recall the document covers that in some of its discussion?
A In general.
Q On page 27, sir, he discusses work done by Dr. Rix at Reynolds. You know who Dr. Rix was, don't you?
A Yes, I do.
Q He's someone who you worked with when you came to Reynolds; correct?
A He was a scientist in the research and development department.
Q And on page 27 at the upper third he

discusses Dr. Rix's work. And is it fair to summarize Dr. Rix's work that when Dr. Rix evaluated tar and nicotine that a smoker would get under more realistic conditions, instead of getting, for Winston, 20.6, that would be the number that you would have on this chart for Winston, wouldn't you, if it was a Winston chart, you would use the FTC number?
A I see a 20.6 in Table 9, first line.
Q And that's for Winston?
A It says Winston.
Q Instead of getting the machine 20.6, for the human smoking conditions he got 35.7; correct?
A Line 3 down shows Winston at 35.7.
Q All right. 1979, Dr. Rix of Reynolds, said if we evaluate Winston instead of under machine conditions, under realistic conditions, we get 35.7 milligrams of tar; correct?
A What it shows --
Q Is that correct, sir?
MR. WAGNER: Judge, I think he can explain his answer.

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THE COURT: I think he was going to explain it.

Go ahead, Doctor.

A What it shows is that Winston, at FTC conditions, shows 20.6 milligrams per cigarette.

Under a 65-milliliter puff, two-second duration, one puff every 45 seconds he measured a tar yield of 35.7.

But I don't think -- I don't think it's a great revelation. The numbers are interesting. It's not a great revelation because, I mean, it's pretty obvious that if you puff harder or more frequent, you're going to get more tar.

Q As Dr. Rix of RJ Reynolds calculated it, under realistic conditions, the smoker gets 35.5 milligrams of tar. 35.7 is up about the range of the number that the machine reports for back in the '50s; isn't that right?

A I think that's approximately correct. And if one took the cigarette from back in the early '50s and smoked under the same 65-cc puff once every 45 seconds, then that number

would be much higher. These are all relative numbers.

Q Now, Dr. Rix's data was unpublished, wasn't it?

A I don't recall whether it was published or not. My guess is, if I had to guess, is probably not.

Q Take a look at page 57 in the references and see if you see a publication listed for Rix or whether you see the Reynolds' internal unpublished laboratory number.

A Page 57?

Q Yes, sir.

A And we're looking at which?

Q I was looking under Rix, 1979.

A I see Rix, Winston and Marlboro Effective Puff Volume Duration Frequency, blah, blah, blah, RDM, 1979, No. 19. That's an internal report?

Q Yes, sir. There's no publication. There's no journal that it's published in, is there?

A There's no citation to a publication.

Q All right. Now, you said on direct that you were on a National Cancer Institute panel addressing these tar and nicotine numbers;

correct?

A That's correct.

Q And you made presentations at that panel and other doctors made presentations as well; correct?

A Made presentation, engaged in scientific discussion.

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Q And you told the panel, in your view, the machine smoking method gave accurate and reliable information for the consumer; correct?
A Yeah, that is correct. And to make sure that this is not taken out of context, the -- it's accurate and reliable for the purpose that the FTC established that method. And the FTC made it clear that individuals smoke differently, that you can't -- that a machine method can't accurately predict what any individual gets, but that a machine method such as the FTC can provide comparison data for making choices in the marketplace.
So if a consumer wants a lower tar, they can use the numbers, or use the categories which are based on the numbers,

to choose a lower tar product in the marketplace. But the FTC was quick to point out, and actually the FTC commissioner reaffirmed numerous times, that it was never intended to accurately represent or to in any way represent what any individual smoker gets. Because the laboratory method can't do that.
So that's the more full representation of what I discussed with that National Cancer Institute panel.
Q Sir, and you told the panel, "It is clear to us from talking with consumers that they understand the notion of tar and nicotine yield; that they make choices in the marketplace."
You don't have your book?
A Of course I don't have my book. Well, you read that correctly, yes.
Q All right. So you told the panel that consumers understood the tar and nicotine data and they were using it to make choices in the marketplace?
A I think that's a mischaracterization. I said that smokers --

Q Let me read the language.
A Please.
Q "It is clear to us from talking with consumers that they understand the notion of tar and nicotine yield, that they make choices in the marketplace."
A And I do believe that smokers understand the notion of tar and nicotine yield. I also believe that smokers make choices in the marketplace.
Q And you knew, Dr. Townsend, didn't you, when you made that statement, that Dr. Rodgman had said, "The conclusion is therefore inescapable --"
MR. WAGNER: Excuse me. Where are you reading from?

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Q Page 38, Rodgman.
"The conclusion is therefore inescapable, that labeling the amount of tar and nicotine on a cigarette package cannot give to the smoker meaningful information as to the amount or composition of the total solids in nicotine he receives from the cigarettes he smokes. He is more likely to be misled than informed."

That's what Dr. Rodgman said in August 1994, didn't he?
Did he say that, sir?
A Can you point me where you're reading?
Q Yes, sir.
A Oh, okay. The first part of that, of that statement, I absolutely agree with. The conclusion is inescapable, that labeling the amount of tar and nicotine cannot give to the smoker meaningful information as to the amount or composition of the total solids in nicotine he or she receives from the cigarette he smokes.
The FTC understood that, and made that clear when they established the method. The FTC commissioners at various points in time have reaffirmed that that laboratory method doesn't reflect what any individual smoker gets."
The next sentence, "He is more likely to be misled than informed," is an interesting one, because I've seen numerous references to the tobacco industry, tobacco scientists and scientists outside of the industry essentially saying that to the FTC

when they were in the process of trying to establish this method.
There were numerous discussions and documents pointing out to the FTC, wait a minute, you've got to be careful when you establish this method because the consumer may be misled if they take these numbers as hard cold facts representing what they get.
The FTC came back and represented that it does provide comparative data for making choices in the marketplace.
Q Now, "He is more likely to be misled than informed." Those are the same numbers that you told the NCI panel gave the consumer valuable information, aren't they?
A Those are the same numbers, and I think I was absolutely correct and still believe that that's correct. We've got a 30-year time span between the time Dr. Rodgman and others, including other people outside the industry, were cautioning the FTC that you've got to worry about misleading the consumer, making sure they don't believe and understand that that's exactly the level they get out of each and every cigarette.

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And then today, 30 years later where we see that having those comparative numbers in place has, in fact, given a basis for the large tar reductions that we've seen in the marketplace, and smokers do make choices based on either the numbers or the categories that are based on the numbers.

For example, smokers choose either a full flavor, a lights, an ultra lights or even the lowest. And even if they don't know the exact, and may not know the exact number, the FTC number that's associated with the particular brand they're smoking, they know they're smoking a lights category product or an ultra lights category product. And that category definition is based on those numbers.

So I think that the FTC method has provided a useful mechanism for consumers to make a choice. Do I think that the FTC method has ever -- gives smokers exact information on the cigarette that they're smoking? Of course not.

Q Now, Doctor, in your presentation to the National Cancer Institute panel on this

procedure, you said that you were aware of surveys within your company indicating that consumers understood these numbers. Do you remember telling the panel that?

A I think some consumers, particularly those in the ultra low tar and the lowest category. The lowest category being the 1 milligram or 2 milligram products, I think some consumers understand that. I think some consumers probably don't know the number, the FTC number of the product they're smoking.

However, I think consumers do know the category, and the category's based on the numbers.

So by any -- in either case, the numbers either directly or indirectly are providing the basis for comparison for consumers to make that choice.

Q What were these consumer surveys you were referring to when you told the NCI panel that you had surveys that said consumers understood the numbers? Did you have surveys done by Reynolds?

A We had a number of focus group-type surveys

of consumers that I'm aware of.

Q Who does those?

A Our marketing department generally establishes those, sometimes in connection with research and development questions. But we've had, sure, focus group studies where we've had consumers in a room and we

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try to explore their understanding of FTC tar numbers.
Q Do you know a scientist at Reynolds called J.H. Reynolds?
A I do know Dr. Reynolds.
Q Do you know J.H. Robinson?
A I know Dr. Robinson.
Q Let me show you a survey signed by Dr. Reynolds and Dr. Robinson. Ness Motley No. 14549.
Do you recognize the names of Drs. Reynolds and Robinson as Reynolds scientists who were engaged in the type of activity that you just discussed; that is, consumer surveys?
A Dr. Robinson and Dr. Reynolds, neither are -- have a job doing consumer surveys. They both do research or have done research

on human smoking behavior.
Q Okay. Human smoking behavior.
MR. WESTBROOK: Your Honor, we move 14549 into evidence.
THE COURT: Any objection, Mr. Wagner?
MR. WAGNER: No objection.
THE COURT: 14549 will be admitted.
(Plaintiffs' Exhibit(s) 14549 received in evidence.)
MR. WESTBROOK: Your Honor, I would like to pass these to the jury. We're a few short. Is it possible for two jurors to look on?
THE COURT: He can use this.
Q Dr. Townsend, I want to direct your attention --
MR. WESTBROOK: May I approach, Your Honor, to show the witness?
THE COURT: Yes.
Q With respect to this study, am I correct that this study shows that, "They measured the nicotine delivered under human smoking conditions to smokers; there was more than 200 percent of that delivered under the FTC

smoking machine conditions"?
A That's what this document says. I don't see the experiment protocol, so I don't understand what that means. I see it says exactly as you read it, though.
MR. WAGNER: What page?
MR. WESTBROOK: I'm on page 2, one paragraph up from the bottom.
Q So that not only the tar, but according to that Reynolds' study, the nicotine levels would be higher than shown on these charts for actual smoking conditions?
A Well, again, I don't know the details of this particular experiment. The words there are exactly as you read them.
Q Now, who were the individuals doing the

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consumer surveys that you relied on when you spoke at the NCI panel about your view of what consumer surveys showed about the understanding of tar and nicotine numbers?

A Well, again, we've had numerous, over the years, numerous focus groups, qualitative consumer research where we try to explore consumers' desire for new products or some of their concerns about existing products.

And at various times we've explored with them what the FTC tar numbers mean, and what the categories mean to them. So there is not one particular survey; there's not one particular group of people.

Q Are you familiar with a J.H. Sherrill at Reynolds?

A I've heard the name.

Q How about a T.E. Sandefur at Reynolds?

A Sandefur, I don't know.

Q Let me show you a document authored by Mr. Sherrill, which is 9937, entitled "Exploratory Group Sessions on Cigarette Smoking."

MR. WESTBROOK: Your Honor, we would move this document into evidence as Exhibit 9937.

THE COURT: Any objection, Mr. Wagner?

MR. WAGNER: One second, Your Honor.

THE COURT: All right.

MR. WAGNER: May we approach for a second, Your Honor?

THE COURT: Yes.

(Bench discussion)

THE COURT: The exhibit as modified will be admitted. 9937 will be admitted.

(Plaintiffs' Exhibit(s) 9937 received in evidence.)

Q Dr. Townsend, let me turn your attention to this Reynolds group session on the tar and nicotine numbers and ask you to look at page 5 under paragraph 5 entitled, "Numbers." Are you with me, sir?

A I see paragraph 5 called "Numbers."

Q Let me read you what the Reynolds group found after surveying these people. "The group showed what other research has shown, there is low awareness of tar and nicotine numbers and no comprehension of what they mean. That is to say, smokers don't really know how to interpret the numbers."

Now, these are the same numbers that you said give consumers valuable information; correct?

A They're speaking to FTC tar numbers in my estimation.

Q Those are the same numbers that you said at this panel gave consumers valuable

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information, same numbers?
A If you go back to what I said as we got into this line of questioning, I think I said smokers may know the numbers, particularly those smokers of the very lowest products, the 1's and the 2's, even though smokers who may not know the tar and nicotine value of the product they smoke, certainly know the category of the product they smoke. And the category of that product, be it lights, ultra lights, or full flavor, is based on the numbers.

So what I said was that those -- those numbers provide a useful comparison for smokers to make choice. They don't have to know the numbers. Some do, some don't.
Q Let me compare what your focus group said, research group said, "That is to say, smokers don't really know how to interpret the numbers with what you said. It is clear to us from talking with consumers that they understand the notion of tar and nicotine yields, that they make choices in the marketplace."

So you think they understand them, but

they don't really know how to interpret them. Which is right?
A Well, I believe what I've said is right.
Q All right.
A I believe that smokers do understand the notion of tar and nicotine yield. They understand that tar and nicotine is yield and that there is a variety of products in the market. They may not know exactly the number of the product they're smoking, but they do know the category of the product they are smoking. And some smokers do know the level -- the tar level of the product they smoke, particularly those who are smoking the lowest level products, because they've had to trade a lot in taste of their product to go to those lower tar numbers.
Q Now, at the NCI meeting that you were at, there were presentations by others who had investigated whether consumers understand these numbers or not. Do you recall that, sir?
A There was one presentation that was a consumer study that I recall.
Q And Dr. Guerin did that?

A Dr. Guerin, no.
Q Who did that?
A It was -- I can't remember his name. I think he was at the University of Florida.
Q And what was your recollection of what that study showed?
A I think -- I think he subsequently published

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that in a peer-reviewed journal, a psychology journal of some sort. My recollection of his overall conclusions was that consumer understanding or awareness of the exact numbers of the product they smoked, the exact tar level, was very low. I think that's my general understanding. And that's consistent with what I've already just said here.

Q And then after you made your presentation and the other presenters made their presentation, the panel reached the consensus and they said the numbers were misunderstood by the public, didn't they?

A That expert panel for the National Cancer Institute arrived at a number of conclusions, some of which agreed with the way I felt and some disagreed with the way I

felt.

Q The conclusion was the available data suggests that smokers misunderstood the FTC test data; correct?

A That's what they said. That was their conclusion.

Q They don't understand this.

A Well, I disagree with that. Excuse me. I firmly believe that those numbers provide a comparison in the marketplace, and only a comparison in the marketplace. The FTC has said repeatedly, as I have here this morning, that they were never intended to accurately represent what any individual smoker gets. No laboratory test method can do that. And if we even take from here the FTC, as we're sitting here today, is considering modifying this test method. That work comes out of the book that you're holding right there. And the FTC is considering changing the test method from what we've already talked about, 35 cc puff taken once a minute, they're considering changing that to a -- I'm sorry, yeah, a 45 cc puff taken once every 30 seconds,

consistent with what we've already said here this morning.

If the FTC takes that step, which they very likely are going to do, then what that does is it shifts all the numbers up. But the relative ranking of the cigarettes will be pretty much maintained. That is, the lowest tar products will go up, the highest tar products will go up. The relative ranking stays the same. It's just the number itself has gone up. It still provides, if the FTC chooses to do that, it is still a useful comparison in the marketplace because it provides a range of rankings that the consumer can use, a lot like EPA gas mileage on cars. It's a

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relative ranking, not to be absolute.
Q Dr. Townsend, the panel also concluded, did it not, that these terms, if I can find them; ultra low, low tar, the lights and the ultra lights, those terms you use in your advertising, the panel concluded that those terms were misleading because they were making health claims to the consumer. A consumer would think if I smoke a low-tar

cigarette, it's healthier and that's not true. Isn't that what the panel concluded?
A I recall the panel concluding something along those lines.
Q And the panel concluded that cigarettes were a lethal product, didn't they?
A I don't recall that specifically. I think most people on that panel would conclude that, however. I don't disagree with that.
Q Now, Doctor, tar, there's something else misleading about the word tar, and that is that all tar is not created equal, is it?
A I don't agree with your premise that there was something, in the first place, that was misleading about the tar. Again, I think it provides a useful comparison for smokers.
Q Doctor, on these sales weighted average tar yields and nicotine yields, are you telling me that if I'm here at 20 milligrams of tar on a Winston and 20 milligrams of tar on a Benson & Hedges, that those tars are going to have the same chemical constituents?
A I never said that.
Q You can have two cigarettes that will give you the same number on the machine and be

entirely different in what makes up that tar, can't you?
A Let me give you -- I agree with that. And let me give you a very good example. If I take one cigarette that has 20 milligrams of tar and is a 50/50 blend of burley and flue-cured tobacco, I'll get 20 milligrams of tar with a certain chemical composition.
If I take another cigarette that has 20 milligrams of tar, but it has 75 percent burley and 25 percent flue-cured tobacco, I would still get 20 milligrams of tar, but the chemical composition of that tar is quite different because the chemistry of the two tobaccos are different. That's one example.
Q Do you think consumers know that?
A I don't know what consumers know about that. I know that they recognize that there are different taste characteristics of various products that have different blends.
Q Now, Doctor, these charts, Camel and Winston and these charts we have here that we've been talking about, these charts concern only the smoke, the third of the smoke that

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comes out here into the machine or into the smoker's mouth; correct?

A These graphs that I've presented are concerned with mainstream cigarette smoke, that that comes out the mouth end of the cigarette.

Q All right. The FTC machine method doesn't report anything about the sidestream smoke levels, does it?

A There is no FTC test protocol for sidestream. In fact, we at Reynolds and other companies in the industry have developed test methodologies to measure sidestream yields.

Q For the two-thirds of the smoke that's coming out into the environment that the nonsmokers can breathe, these tar and nicotine numbers aren't going to tell me anything, are they?

A No, I don't agree with that. I've already testified this morning that there were general trends in Dr. Ogden's study, Dr. Ogden and Dr. Pat Martin, where they took the top 50 selling brands in the United States, they evaluated the sidestream

yields. I'm sorry, they evaluated the ETS yields, not the sidestream. They evaluated it diluted and aged in a chamber. And what they found was that, in general, the higher tar products had slightly higher ETS levels. The ultra low tar and the lowest tar products in that market survey showed overall significant reductions in ETS. So in a general sense, I disagree with you based on that study.

Q Number one, these numbers do not relate to sidestream yields? They don't give you sidestream numbers, do they?

A Those numbers plotted there are mainstream numbers. If you're saying, could I take that number and predict what the sidestream would be, if that's your question, the answer is, I don't know how to do that. But I do know that Ogden's market survey showed that some of the same tools that reduce mainstream tar also reduce ETS.

Q Now, you mentioned Dr. Dietrich Hoffmann on direct examination, and you regard Dr. Hoffmann as a respected scientist, don't you?

A I've known Dr. Hoffmann for a number of years. I regard him as an excellent scientist.

Q He's somebody who has sat on panels with you? He was on that NCI panel, was he?

A He was on the NCI panel with me. He was on the Canadian health panel for cigarette

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modifications. I've had many occasions to talk with him about scientific issues over the years.

Q Let me show you an article by Dr. Hoffmann, "Formation and Analysis of Tobacco-Specific N-Nitrosamine."

Doctor, do you recognize Dr. Dietrich Hoffmann as the senior author on this paper?

A Yes, I do.

MR. WESTBROOK: Your Honor, I would like to ask Dr. Townsend some questions about Dr. Hoffmann's paper.

MR. WAGNER: I don't have a copy, Judge. He gave -- we only have one copy. You were reading it, and I wasn't going to hurry you along.

THE COURT: Go ahead.

MR. WESTBROOK: Nor was I.

THE COURT: Do you just want to inquire about the article, Counselor?

MR. WESTBROOK: Yes, Your Honor.

THE COURT: Go ahead.

MR. WESTBROOK: I don't intend to introduce it.

BY MR. WESTBROOK:

Q Dr. Townsend, I want to direct your attention to Dr. Hoffmann's work on page 130, where he measured the yields of sidestream smoke components to specifically the tobacco-specific nitrosamines.

Do you see table 6, sir?

A I see table 6 on page 130.

Q And is it correct, sir, that when Dr. Hoffmann did an evaluation of the sidestream yields, he found that the highest levels of nitrosamines came from the filtered ultra light cigarettes?

A According to these numbers, in general, Dr. Hoffmann shows the ultra light product, and there was one in this table, showed higher numbers than the others with the exception of NNK, the last column. And NNK showed in a non-filter product to have the

highest NNK level, not the ultra light.

Q For the total of the nitrosamines that he measured four of them, did he not?

A There are four measured.

Q And you know that nitrosamines are substances that are thought to be cancer causing in cigarettes. That's the scientific view, isn't it?

A These four tobacco-specific nitrosamines, particularly NNK and NNN, are thought to be animal carcinogens.

Q All right. And when Dr. Hoffmann measured the sidestream smoke, he found that the filtered ultra lights had the highest levels of those cancer-causing substances. That's what he found, isn't it?

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A And I just told you that for the first three in here, in the table, NNN, NAT and NAB, that's directionally the case.
Q And for the last one?
A And for the last one, NNK, which Dr. Hoffmann has, I think publicly stated he regards that as the most problematic tobacco-specific nitrosamine, that it shows a higher level, 468 in non-filtered B

cigarette versus the 352 nanograms in the J cigarette.
Q Let's back up. When you said problematic, you mean Dr. Hoffmann regards that as potentially the worst of all the nitrosamines, doesn't he?
A I think that's a fair statement.
Q And for the worst of all the nitrosamines, Dr. Hoffmann found that the filtered ultra light was the second highest; correct?
A If you look at the numbers as hard numbers, I think that's correct.
Q And for the total nitrosamine yield, adding all of the nitrosamines that came off, he found that the ultra light was the absolute highest, released the most nitrosamines of all the cigarettes, including the unfiltered cigarettes. That's what he found, didn't he?
A That's not the way I read this. Look at B, look at the total. Isn't that a 979? And isn't that higher than 944?
Q You're right. He found the second highest, sir.
A Okay.

Q Second highest for all?
A The other thing to keep in mind here is that these particular analyses are extremely difficult, and I know that because we do that in our laboratory. And, frankly, I'm not sure that there is a difference between 330, 305. There may be a difference between 330 and 170 for NNN. These are very difficult things to measure, and there may be differences among some of the cigarettes here in sidestream. I'm not debating that with you.
Q But for the cigarettes that the chart would say are the lowest, the ultra lows for tar and nicotine, by the machine, and putting aside all the problems with the machine, Dr. Hoffmann measured what comes off that other two-thirds and he found, as you point out, the second highest levels of these cancer-causing nitrosamines came off the ultra lights. That's what he found; correct?
A This is an experiment with a limited number of cigarettes. I think, strictly speaking, if you look at those numbers as hard numbers

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with no variation, your statement is correct.

I think if you look at the entire picture, I don't think there is enough data here to conclude that one way or the other. It may be. I'm not debating that. I just don't know.

Q Would you tell the jury what the sidestream smoke deliveries were for Winston in 1973?

A Well, I don't know a specific number for Winston in 1973. Certainly we could go back to Reynolds' data in the research and development department and see what's available for commercial products in that time period.

Q Do you have any other charts outside that are sidestream level charts that we could look at?

A No. I can give you a general idea of the level of sidestream tar in conventional products. But if you're asking for a specific brand style at a specific time, I can't do that as we sit here.

Q Doctor, let me hand you another document that's in evidence, 14398, another research

article by Dr. Rodgman, research report.

Doctor, I want to direct your attention -- the page numbers are hard to see.

MR. WESTBROOK: May I approach the witness, Your Honor?

THE COURT: Yes.

Q Page 14, the page is cut off here, where Dr. Rodgman compares mainstream and sidestream components.

A I got it.

MR. WAGNER: I'm sorry. I didn't hear what page.

MR. WESTBROOK: Page 14.

MR. WAGNER: Thank you.

Q Do you see at the bottom of the first full paragraph under mainstream and sidestream smoke, where Dr. Rodgman says, "The levels of some components in the sidestream are about three times the level in the mainstream smoke. For others the ratio of sidestream to mainstream levels may be as high as 10 or 15."

Do you see that, sir?

A I see where it says that. That certainly

reflects different chemistries between sidestream and mainstream smoke. There are different ratios of chemistry between the two smokes.

Q All right. Now, going down under environmental smoke, first full paragraph, do you see the last sentence, "Thus for a

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given room volume, environmental smoke will vary depending on the number of smokers in the act of smoking, their particular smoking habits, such as puff volume, puff frequency, puff duration, number of puffs per cigarette, degree of ventilation, et cetera, plus the degree of ventilation in the given room."

Do you see that, sir?

A That's what it says.

Q So Dr. Rodgman was studying this environmental tobacco smoke issue back in 1976, wasn't he?

A In 1976, Dr. Rodgman had a number of scientists working for him.

Q Who were studying the issue?

A Who were studying the issue.

Q And Dr. Rodgman got to write up the reports?

A I think this is Dr. Rodgman's summary, probably, of a number of internal reports.

Q Now, you talked on direct about a number of advances that your company had made in cigarette design, such as filters; right? You said filters were one of the main general reduction mechanisms for smoke components?

A Well, efficient filters.

Q Efficient filters.

A Air dilution, expanded tobacco. There were a number of them we talked about.

Q Let's talk about filter, air dilution, expanded tobacco. Filters have an effect on the mainstream smoke, don't they? They can reduce some particulate matter and maybe some vapor phase that comes through the filter; correct? Some things?

A That's correct.

Q They don't have any effect on the sidestream smoke, do they?

A Certainly not a significant effect, I wouldn't think.

Q We talked about air dilution, those little holes that you punch in the filter to let

air come in and then some porousness. Air dilution doesn't have any effect on the sidestream smoke coming off the cigarette, does it?

A I wouldn't say a significant effect. One thing we do know is that air dilution vents change the gas flow inside the cigarette during smolder, so I think there is probably a very, very small effect.

Q Dr. Rodgman -- this isn't a revelation. In 1976, Dr. Rodgman said that, didn't he? "The quantity of sidestream smoke is not substantially reduced by blend adjustment --"

A Where are you reading?

Q Two paragraphs down under "Environmental

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Tobacco Smoke." Do you have it, sir?
A I see it.
Q "The quantity of sidestream smoke is not substantially reduced by blend adjustment, unique filtration, or air dilution systems, paper porosity adjustment used specifically to produce a low-tar cigarette."
In 1976, Dr. Rodgman said this stuff we're doing to produce a low-tar cigarette

isn't going to have any effect on what's coming off here into the nonsmoker's breathing zone. That's what he said, isn't it?
A You read that accurately. The thing, obviously, that's missing, though, is tobacco rod weight, which is a result of the use of expanded tobacco, reducing the packing density, reducing the circumference to reduce tobacco weight. I wouldn't put a question mark there. I would put a plus there.
Q How big would you put that plus?
A Well, I don't know.
Q You wouldn't put it very big, would you, Doctor?
A If you reduce the amount of tobacco being burned, you will affect and do affect the sidestream generation and consequently ETS levels.
Q Doctor, you said filter and air dilution and expanded tobacco were your big guns, so to speak, on mainstream reduction; is that right?
A Those are the three most important design

variables that reduce mainstream yields.
Q Is it your testimony that expanded tobacco in the cigarette effected a significant reduction in sidestream smoke yields?
A I just told you that I think reducing the tobacco weight by whatever means you do it will reduce sidestream yields and consequently ETS yields. Expanded tobacco contributes to that.
One also can reduce the way the cigarette maker packs the tobacco rod to reduce the total weight in addition to the impact of expanded tobacco. One also can use reduced circumference, and one also can use shorter tobacco rod lengths.
And, in fact, those are the main tools that we use, together with a specially-developed cigarette paper for sidestream reduction. Those are the tools that we put together in combination to develop Vantage XL, Horizon and Chelsea which we tied to test market, which we did test market.
Q Doctor, as a result of you using these filters and poking the holes, isn't it true

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that the ratio between sidestream smoke and mainstream smoke actually has gone up over the years? There's proportionally more sidestream smoke versus mainstream smoke components?

A Well, I don't know that I've -- I can't remember ever doing a thorough analysis of that. I would say if one develops an ultra low tar or even some low-tar cigarettes where you efficiently removed the mainstream particulate, of course, that -- you can have the same sidestream yield, reduce the mainstream, that's going to change the ratio. But it does turn out that some of the techniques, particularly the tobacco weight, by virtue of however you choose to get there, affects the sidestream as well. Now, the mainstream can go down. I don't see that the ratio tells a whole lot. One needs to look at the values for both.

Q Doctor, I think you said that you were on a panel with Dr. Michael Guerin who is on the NCI panel?

A Uh-hum.

Q He's a respected scientist?

A Guerin is a well-known respected scientist, yes. I don't know him very well.

Q He's someone who has worked in the field of environmental tobacco smoke over the years?

A I believe he has, sure.

Q You may not know this, Doctor, but we had his colleague, Dr. Jenkins here the other day, and we had the Jenkins and Guerin textbook on environmental tobacco smoke. And I want to ask you about a couple of statements made by Drs. Guerin and Jenkins in their book concerning this issue, and I have just the one.

MR. WESTBROOK: Your Honor, may I approach the witness with it?

THE COURT: Go ahead.

Q The book is entitled, "The Chemistry of Environmental Tobacco Smoke Composition and Measurements" by Guerin, Jenkins and Tomkins; correct?

A That's what it says.

Q You've seen this book before, haven't you?

A I've seen it. I haven't read it. I have seen it around.

Q That's the same Dr. Guerin, isn't it?

A Yes.

Q Published by the Center for Indoor Air Research?

A That's what it says.

Q That's the tobacco-sponsored group?

A Center for Indoor Air Research is sponsored by the tobacco industry and provides funding

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for independent research.
Q All right. Let's read from page 54. "The findings that accept for hydrogen cyanide and a few phenolic or carbocyclic acid constituents, a great much greater quantity of each smoke constituent is released in sidestream smoke than is transported in mainstream smoke."
Did I read that correctly?
A You read that accurately.
Q You don't disagree with that, do you?
A No. There's no reason for me to disagree with that.
Q Then they speak about these product innovations that you talked about on your direct testimony. "The use of sidestream-mainstream ratios to indicate sidestream deliveries is very misleading,

however, for filters, currently by far the most popular products, and very low tar increasingly popular products. This is because product innovations to date, such as filtration, ventilation, and tobacco processing have focused on reducing mainstream deliveries. Mainstream deliveries have been dramatically reduced while sidestream deliveries have stayed the same or have been only slightly changed."
They say the sidestream delivery has either stayed the same or been slightly changed. Do you disagree with that?
A In relation to the change in mainstream cigarette smoke yields, I don't disagree. I think what Dr. -- again, Dr. Ogden's market survey showed was that for ETS levels, there was an overall difference. Was it a huge difference compared to the reduction in tar levels in mainstream? No. But it was a real difference.
And I think, again, tobacco weight, either through expanded tobacco to change dimensions or however you choose to get there, affects sidestream yields.

Q All right. Let's talk about these tobacco specific nitrosamines that Dr. Hoffmann measured, under the heading N-nitrosamines. "An additional factor that makes nitrosamines of special interest is that much larger quantities," then they give a reference, "are released in sidestream smoke than in mainstream smoke. At least 10 times and up to 50 times more VNA is released in sidestream than mainstream smoke, and at least four times and up to 10 times more TSNAs are released in sidestream than mainstream smoke."
And the TSNAs are the tobacco-specific nitrosamines Dr. Hoffmann measured; correct?
A That's correct. And also the VNAs are

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volatile nitrosamines, and probably one of the main contributors to that ratio being high, if you take his numbers at face value; if you accept those numbers, one of the reasons that they're high is that cellulose acetate filters selectively remove the volatile nontobacco-specific nitrosamines, which will then change the ratio, which again gets us back to the -- that one has to

be very careful in looking at ratios. It could be that the sidestream changes or the mainstream changes, and in case of the volatile nitrosamines, I think there's a clear change in the mainstream value.

Q But the filters, regardless of what the filter is, it doesn't affect what's coming off the sidestream?

A I think that's reasonable.

Q Now, you talked about reconstituted tobacco; correct?

A Yes, I did.

Q Now, reconstituted tobacco in layman's terms is you get the sweepings that you used to throw away and some smart fellow or lady figured out a way to sort of glue them together into paper and get them into the cigarette. Isn't that what it is?

A Well, I think that's a mischaracterization of the whole thing. The idea that these are sweepings is incorrect. I went through this morning how we stem tobacco to remove the mid rib, the stems, and try to get the leafy portion, also known as lamina.

And in that process of stemming the

tobacco, trying to take it apart into the pieces, there is generated small particles of tobacco and even tobacco dust, and tobacco stems. Those are not floor sweepings, they're not trash. They are tobacco that comes out of that process through sieves. We take those pieces that are the wrong size to make cigarettes, and we turn them through the reconstitution process into the right size to make cigarettes.

Q Doctor, before somebody came up with the idea of getting this dust and sweepings up, you used to throw that stuff away, didn't you?

A Again, they're not dust and sweepings in the sense that you're referring to. Those were materials that we couldn't use in the cigarette, and we did landfill it prior to the development of reconstituted tobacco.

Q You put them in the landfill first? That's what you originally did with them; correct?

A We couldn't use them. Before the invention of reconstituted tobacco, we couldn't use them in cigarettes, and so consequently they

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went to the landfill.
Q And the reason reconstituted tobacco was invented was economics. Somebody figured out how to save the landfill costs and to make some money out of something you were throwing away. That was the reason it was invented, wasn't it?
A I think that's absolutely correct. That was the motivation for the development of reconstituted tobacco in the late '40's.
As the smoking and health issue started down the track in the '50s, and we started doing mouse skin painting studies, and the National Cancer Institute and the TWG, Tobacco Working Group, started doing mouse skin paintings and other biological tests, we found, after the fact, that reconstituted tobacco generated less tar, and it had reduced mouse skin painting tumorigenicity. No question that the original intention of reconstituted tobacco was economic.
Q It was originally waste.
MR. WAGNER: Judge, objection. This is argumentative, repetitive.
THE COURT: Sustained. He's told

us what it was.
MR. WESTBROOK: Thank you, sir.
Q Doctor, you said on direct, and I tried to write your language down, that with general reduction, everything was coming down. Do you remember saying that? Nothing was going up.
A I remember saying that, but also with the phrase more or less to the same degree.
Q More or less to the same degree. All right.
Now, something else happened over the years with tobacco and cigarettes, and that you changed the formulation of the leaves going in, didn't you? Didn't the relative proportions of the leaves change from what was burley in the old days and the percentage of burley in the new days?
A I'm not aware of a dramatic change in the overall proportion of burley and flue-cured, if that's what you mean.
Q You mentioned you served on a Canadian panel. Do you remember that panel had you and Dr. Hoffmann were on there?
A I remember that.
Q All right. Let me show you -- and

Dr. Hoffmann made a presentation. You remember that, don't you?
A I remember that.
Q He's an expert on tobacco, he's worked in the field for 40 years or so?
A He's certainly a knowledgeable scientist in the area. He's a good scientist. I have a

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lot of respect for Dr. Hoffmann.
Q Looking at what Dr. Hoffmann had to say, it's 13. "In countries where tobacco blends are utilized for cigarette manufacture, example, U.S.A., and Germany, the relative proportion of burley tobacco in the blend has increased."
Do you agree with that?
A No, I don't agree. And, in fact, I was surprised when he presented that in Canada. I went back to staff in my area and asked them to dig through records and see if that, in fact, is the case. They did, and we can't see any significant increases in burley in our blend over the years proportionate to flue-cured.
Q Then how do you account, Doctor, that the fact that the nitrosamines are going up in

cigarettes?
A That's the other curious thing about his presentation. He's also published that in several peer-reviewed journal.
Q He presented it in Canada, didn't he?
A He presented it in Canada, and as I said --
MR. WAGNER: Just a minute, judge. I'm going to object to further questioning this witness about what somebody else said outside the courtroom. This is all hearsay.
MR. WESTBROOK: Your Honor, this is a panel on which the doctor was present. I'm going to ask him if Dr. Hoffmann said it and whether he agrees or disagrees with it as part of a basis of his opinion about everything coming down after he heard Dr. Hoffmann saying things weren't coming on.
MR. WAGNER: If we two sit on the same panel, I don't necessarily adopt everything that counsel says, Your Honor.
THE COURT: I understand that, but he generally can ask him about the doctor's statement.
Q Doctor, let me conclude this. Look at the

chart, which comes off page 15 of the report. Do you remember on this chart that Dr. Hoffmann had a chart which compared the benzo(a)pyrene, and that's linked to tar, right, roughly to tar?
A Benzo(a)pyrene generally is reduced about to the same degree tar is.
Q He showed benzo(a)pyrene came down in cigarettes, but the nitrosamines were going up; correct?
A That's actually -- I remember that chart very well, because that, together with the idea that the burley level has gone up in cigarettes; I think he even went another step and suggested the nitrate level in tobacco blends has gone up, I found very

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interesting, very curious. I didn't understand quite how he arrived at that, so I went back, as I was trying to tell you just a minute ago, asked my staff to look at a number of things.

The first thing was the question if you look at our historical data, has the burley level gone up. And within our Reynolds internal data, we cannot find evidence that

the burley level relative to flue-cured has gone up significantly.

The second thing was has the nitrate level changed and gone up or down or has it changed. My scientists came back to me and said, well, here the data are a little more sparse, but, again, they bounce around. There is no clear evidence that the nitrate level has gone up.

Then the third question was exactly to this chart, because I found that chart very curious. Has the tobacco-specific nitrosamine, NNK, or any other tobacco-specific nitrosamine, gone up over time, particularly over this time period. And my scientists went back, and we found no data that substantiate that increase. The nitrosamine values that we get bounce around a lot because it's an extremely tough and difficult analysis.

So what I've asked my scientists to do is go back and find cigarettes that go through that time period and beyond. We've now located those cigarettes, and we're doing those nitrosamine analysis as we

speak; not just for NNK but for all of them. Because I find that very curious. I'm not sure why that would be the case. I'm not sure that that's the case at all.

But certainly Dr. Hoffmann has presented this as his research. I'm going to go back and see if I can replicate it. If I can, Dr. Hoffmann and I will talk about it. If I can't, Dr. Hoffmann and I will talk about it. Because we've already talked about that.

And I can recall at least one occasion expressing my concern to Hoffmann about his hypothesis that the burley levels have gone up. That's just not consistent with what we've seen.

Q All right. With respect to nitrate levels, is reconstituted tobacco made up of some, did you call them ribs, stems and ribs?

A No. The mid ribs are actually discarded.

Q How about the stems?

A The stems are included at a certain level.

Q Do the stems have a higher nitrate content than the leafy part which you call lamina?

A The chemistry is quite different. It does

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tend to have a higher nitrate level. It also tends to have a significantly lower nicotine level and has a low sugar level as well.

Q And higher nitrates are linked to higher nitrosamine yields, aren't they?

A Well, they have theoretically. One of the things, nitrosamines have been very important to the research and development, not only in Dr. Hoffmann's lab, but in ours.

We've got two different approaches or two different theories of how nitrosamines come to be, tobacco-specific nitrosamines come to be in smoke. One theory is that they're formed in the tobacco before the tobacco is burned.

Another theory is that they're formed during the burning of tobacco. And I think Dr. Hoffmann, scientists in our labs, scientists in Germany, there have been a number of experiments conducted to try to see which of these mechanisms actually are right. Or maybe it's a combination of the two. So we've tried to understand how nitrosamines come into smoke.

THE COURT: Counselor, I'm going to -- you can finish that. I'm going to stop you right now. I think one of the jurors needs the break. We'll take the afternoon break, ladies and gentlemen. We'll break for about 15 minutes. When we come back, we'll conclude your testimony, Doctor.

(Standard admonition)

MR. CASSELL: All rise.

THE COURT: You may step down.

(A brief recess was taken.)

MR. CASSELL: All rise.

THE COURT: Be seated. Jury is back.

Just have a seat, Doctor. And for the record, state your name again.

THE WITNESS: My name is David Townsend.

THE COURT: Thank you.

Counselor.

MR. WESTBROOK: Thank you, Your Honor.

BY MR. WESTBROOK:

Q Dr. Townsend, just to finish up here, I

think we were in mid-sentence or mid-question about higher nitrate content. It's correct, is it not, that higher nitrate content has been related to higher nitrosamine yield in cigarettes; correct?

A Again, that's what I was -- I think we were in mid-sentence, and I'll just try to cut

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this very brief. There are two ways that nitrosamines, tobacco-specific nitrosamines, can wind up in smoke. The first is that it could be produced in the leaf, and then transferred to smoke. Or it could be produced during the burning of the tobacco. And there have been a variety of experiments, both in Dr. Hoffman's lab and our lab using radioisotope tracers. There's a laboratory in Germany that's also conducted similar experiments to try to sort out which is it.

And at least all the evidence, most of the evidence at this point points to, that tobacco-specific nitrosamines are formed in the leaf during curing. And so the presence of added nitrate via stems may not increase the level in smoke. Certainly, the amount

of nitrosamines present in the leaf as a result of the curing certainly does affect it, the amount found in smoke.

So I think there are some scientific issues here. I think back to your original question about does this increase? That's not consistent with the data we have internally, but I've asked my scientists to go back, collect products that we have in the freezer from a broad span of time, and actually using the very same analytical method done at the same time, do that comparison to find out.

I'm skeptical that it goes up. I've expressed that to Dr. Hoffmann.

Q Just returning to Dr. Hoffmann's presentation at the panel that you attended after he talks about the blends, it says, "This means that the nitrate content of these cigarette tobaccos is higher, leading to an increase in the smoke yields of nitrogen oxides and nitrosamines and especially of the nicotine-derived N-nitrosamines, including NNK."

That's what Dr. Hoffmann said in his

testimony?

A That's what he said. That gets exactly to the answer I just gave you.

Q Now, you talked on direct examination about some of the additives in cigarettes. You were talking about ammonia, and I think you talked about some additives to the paper. Has your group been involved when a cigarette blend is developed in dealing with the groups that work on additives as well?

A Well, we do. The product developers, and again, I think yesterday I broke it down into two types of additives or ingredients. There's casing materials, like humectants, sugar, licorice and cocoa; and then there are flavor ingredients or additives.

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The way we do this at RJ Reynolds, is product developers will design products with different blends, different air elution filters, obviously, and other things, and also with different levels of humectant, glycerin, sugars, licorice and cocoa. But the flavor ingredients are usually proprietary.

We have a flavor research group outside

of my area, and we have a group of toxicologists also outside of my area. And these three groups work separate -- well, they work hand-in-hand, but they each have their own separate responsibility on these flavor materials.

Because a lot of the flavor packages that we use, materials, combination of a number of things, we get those from flavor supply houses, suppliers to the industry, and some of those formulations we work up ourselves, but a lot of them are proprietary to them.

But our toxicologists know exactly what's in it. They protect that proprietary secret for our supplier, and my product developers work hand-in-hand with the flavor researchers and the toxicologists in devising the overall additive formulation. My product developers, in most cases, don't know the details of the additive formulation, but of course they do go out and test those with smoke panels or even consumer studies.

Q Were you involved, Doctor, in the

development of the Winston No Bull cigarette blend?

A I had some involvement, yes.

MR. WESTBROOK: Your Honor, may I approach the bailiff to get an exhibit?

THE COURT: Sure.

Q Now, Doctor, you're aware, are you not, that the No Bull cigarette has been advertised as a cigarette having no additives; right?

A I've seen the advertisements.

Q All right. And the fact is that while there are no additives in the tobacco itself, there are additives in the filter and in the paper. Is that right?

A The cigarette filters and the cigarette paper used in the new Winston with no additives, no tobacco additives, in fact, does contain some additives. The cigarette paper, for example, contains -- they're conventional papers, like used on other products, and contain a compound called sodium citrate, to speed up the burn rate of the cigarette paper, like we talked about earlier.

The filter will also contain titanium

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dioxide to make the filter fibers white.
Q And Reynolds has been telling the public, has it not, that continuing to smoke cigarettes with additives, when Reynolds has a no additive cigarette, is not a smart thing to do; isn't that right?
A I don't know that.
Q Let me show you an exhibit which is in evidence, Exhibit 86, a recent ad for Winston, says "Still Smoking Additives."
A That doesn't say what you just said, though.
Q I want you to take a look at the ad, sir, and tell me, does that picture give a message to you that if you're still smoking additives, you're doing something that's not smart?
A Well, I don't know about smart. It certainly is an unusual ad.
Q What is the message you get from that ad? "You're still smoking a cigarette with additives," what does that picture tell you?
MR. WAGNER: Asked and answered, Your Honor.
MR. WESTBROOK: I don't think he did answer it.

THE COURT: I'm not sure that question is relevant. Sustained.
Q Now, Doctor, you've done tests at Reynolds and you've determined that the cigarette without additives seems just as dangerous as the cigarettes with additives, haven't you?
A Well, certainly there have been a lot of evaluations of various additives at Reynolds, and outside of Reynolds there's a lot of information in the scientific literature.
Q Maybe I wasn't clear. I meant you've done evaluations on the No Bull blend, and you've concluded that the cigarettes, the No Bull blend, without additives, is just as dangerous as the normal Winstons.
A Based on all that I've seen, I'm not an expert in toxicology, obviously; but based on all that I've seen, there's no reason to believe that there's any difference in the potential health risks of an additive tobacco blend and a no additive tobacco blend.
Q And you've actually tested the No Bull Winston versus the Winston that existed just

before its introduction, haven't you?
A There have been a number of chemical tests and biological tests.
Q Now, Doctor, is it true that it was not until 1992 or 1993 that Reynolds developed a tobacco blend to specifically try to reduce the nitrosamines?

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A I don't think that's accurate. I think there have been a lot of attempts at Reynolds going various different directions to try to reduce or eliminate nitrosamines. In particular, tobacco-specific nitrosamines. So I think it's not accurate at all to say it wasn't until 1992 that we tried. It was in 1992 through '95 or thereabouts that we were finally successful in designing a cigarette that did have major reductions in some of the tobacco-specific nitrosamines.

Q All right. And was that a product called Winston Select EW?

A EW is an internal code name for the project. We did test market that product as Winston Select in one area.

Q All right. When did that product come out

to the market?

A I believe it came on test market in 1995, if I recall. Stayed in test market until 1997.

Q All right. And this was the blend that you developed to try selectively to reduce these nitrosamines we were talking about for a while; right?

A My scientists developed that product that we did test market as a Winston Select. It did include selective reduction techniques, and there were two major ones: A very unique blend, that's proprietary, to reduce a number of nitrogen-containing compounds, including tobacco-specific nitrosamines.

It also included a special filter that very effectively reduced a number of volatile or vapor phase compounds from the smoke and, so that product doesn't reduce -- result in a reduction of just nitrosamines. There were a large number of chemical constituents in smoke that had been at various points considered a theory, as we've talked about earlier. Winston Select showed significant reductions in a large number of those. And that's what I referred to in the

answer to an earlier question, that even though the tar and nicotine levels haven't continued down, one of our approaches has been to come back and look at multiple selection -- multiple selective reduction techniques all together to try to reduce as many, recognizing that there's probably not one silver bullet in smoke.

Q Now, this product which had lower nitrosamines, if nitrosamines, in fact, cause cancer, it would be a good thing to lower nitrosamines, wouldn't it?

A If tobacco-specific nitrosamines at the levels that they're in cigarettes did, in fact, cause cancer, of course it would.

Q Okay.

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A You know, the fact is, we don't know that they cause lung cancer at the levels present in smoke. We don't even know that they're a human carcinogen at this point. They're certainly thought to be an animal carcinogen.

However, all that said, if one is trying to design cigarettes to respond to smoking and health issues, the fact that

we've reduced nitrosamines and a number of other constituents in the smoke is in the right direction. Makes common sense to me.

Q Now, you introduced Winston Select in Oklahoma; is that right?

A Winston Select was test marketed for that period in the State of Oklahoma.

Q All right. And it was consumer acceptable. It seemed to be doing pretty well, didn't it?

A Well, my conclusion is that the product was reasonably consumer acceptable. It stayed in the market for a prolonged period of time. We didn't see the market share decline. It stayed about the same.

Q All right. But then, when your marketing people wanted to roll out No Bull, you pulled the Winston Select and replaced it in Oklahoma and everywhere else with No Bull because it was a nationwide campaign; correct?

A The Winston No Bull was a national campaign. We did stop the test market when the No Bull campaign rolled.

Q Right.

A We had considered taking it out before because, frankly, the test market had run its course. It had stayed in test market for two years. We weren't going to learn any more, so we took it out at the same time we rolled out the new Winston to avoid having really a confusing issue in the State of Oklahoma.

Q Now, the Winston No Bull, it doesn't have the lower nitrosamine blend tobacco, does it?

A The blend that's used in the EW product was an unconventional blend, a proprietary blend, and is not the blend in Winston No Bull.

Q So Winston Select with lower nitrosamines got taken off the market, replaced by Winston No Bull and, Doctor, it's your opinion that No Bull is just a marketing gimmick, isn't it?

A Well, I don't know about marketing gimmick. I've told you what I believe the Winston No Bull product is. It's a product without additives to the tobacco. We've talked about whether that represents reduced risk.

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I've told you what I believe about it.
Q Do you recall testifying under oath, sir, that the No Bull was a marketing gimmick?
MR. WAGNER: Deposition, line page, please.
MR. WESTBROOK: Barnes 508.
MR. WAGNER: Case.
MR. WESTBROOK: Barnes 508.
MR. WAGNER: Barnes 508.
A It says in answer to the question: "What does No Bull relate to, though?"
Q And your answer?
A My answer is: "That's a marketing gimmick."
Q So your company replaced what might be a safer cigarette with a marketing gimmick; correct?
A I told you what Winston Select was replaced with.
Q Doctor, have you developed a lower sidestream smoke cigarette for sale in Japan?
A Yes, we have.
Q Is that for sale here in this country, too?
A Not at this point.
Q Now, Doctor, you talked about on direct of

some work that you've done looking at nicotine, ammonia and nicotine. Do you remember that testimony?
A Yes.
Q And I think you mentioned that one of your competitors had a cigarette, was it called Next, that was introduced without nicotine?
A One of our competitors in the late '80s actually marketed a number of products. Next was one of those. There were various other versions. There was a Merit De-nic product, specifying or alluding to denicotinization. I think there were also varieties on Benson & Hedges. There were probably as many as 15 or 16 different brand styles marketed at that time by our competitor.
Q You believe that nicotine is essential for cigarettes to be acceptable in this country, don't you?
A I think nicotine -- this is my opinion as an experienced product developer -- nicotine is an important part of smoking cigarettes like Next that have extremely, extremely low levels of nicotine but high tar, are not

acceptable to smokers.
Q Doctor, does nicotine play a role in the formation of the nitrosamines, the TSNAs?
A The tobacco-specific nitrosamines are reaction products that include -- that involve nicotine.
Q And, Doctor, when you were talking about

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nicotine and the review that you had done on how ammonia affected nicotine, where did you get that information from, Reynolds research documents?

A Are you talking -- which information are you talking about, the historical pH data?

Q The presentation you made here. Did you get that from documents?

A Well, let me try to make this clear. The overall theory that I was trying to describe, in probably overly simplistic terms, was, in fact, the theory that many scientists had advanced, including some Reynolds scientists and scientists outside the industry, the pH data that I was trying to represent was internal RJR data over a long period of time.

Q Doctor, do you know whether Reynolds, during

the period up to 1991, ever shipped any lower nitrosamine cigarettes to the VA Medical Center in Marion?

A By lower nitrosamine cigarettes --

Q Well, a blend, like Winston Select, that was formulated to reduce nitrosamines.

A Winston Select, which did achieve a reduction in certain nitrosamines and a number of other constituents, was sold in Oklahoma and Oklahoma only, in test market.

Q All right. You were telling us about your nicotine work, sir. In the course of your career at Reynolds, did you meet a scientist Claude Teague?

A I know Claude Teague.

Q And he was a higher level research person than you at Reynolds?

A At the time, yes. He was director of -- well, he changed jobs a number of times, but he was generally a level director when I was pretty much a new kid on the block.

Q Let me show you a document that I believe you have seen before. It's Exhibit 7578. Dr. Townsend, I believe you testified before that this document is in Reynolds' R & D

library; correct?

A That's correct.

Q You saw it before 1997, didn't you?

A I have seen this in the past.

Q This document is marked "confidential." It's a document Reynolds didn't want out in the public; right?

A Most of the things in our research and development department are marked confidential, and even those that are not are still confidential.

Q All right. And it's signed by Mr. Teague?

A Appears to be.

MR. WESTBROOK: Your Honor, we would offer Exhibit 7578 into evidence.

MR. WAGNER: Judge, I'll object to

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this document for the reason it has no relevancy to this witness' testimony.

MR. WESTBROOK: Your Honor, it addresses nicotine, a subject he discussed on direct testimony.

MR. WAGNER: The subject he addressed on direct testimony, Your Honor, had to do with ammonia.

THE COURT: Objection is noted and

overruled. 7578 will be admitted.

(Plaintiffs' Exhibit(s) 7578 received in evidence.)

Q Dr. Townsend, if we could, let's take a look at this document. Page 3, sir, first full paragraph.

A Okay.

Q "Happily for the tobacco industry, nicotine is both habituating and unique in its variety of physiological actions. Hence, no other active material or combination of materials provides equivalent satisfaction."

Do you see where I read there, sir?

A I see what you read.

Q It's your view from your experience in the tobacco industry that, indeed, nicotine is essential for the sales of cigarettes, isn't it?

A I think nicotine is certainly very important to the consumer acceptance of the product. We know that by experience from Philip Morris's experience trying to market Next and Merit De-nic where the nicotine levels were brought down to extremely low levels.

Q Look at page 9, paragraph 5, where

Dr. Teague discusses, "Study means for enhancing nicotine satisfaction via synergists, alteration of pH, or other means to minimize dose level and maximize desired effects."

Is that what you were talking about on direct, the alteration of pH of smoke of nicotine?

A Well, that's one description of the theory. I think Dr. Teague as well as several other scientists at Reynolds have expressed that theory in a variety of different frameworks. What I did was try to boil it down to something very -- pretty straightforward without a lot of technical detail. Dr. Teague was certainly one of the scientists at Reynolds who considered that a reasonable theory.

Q And Dr. Teague -- turn to page 1 of Dr. Teague's memorandum. Let's look at how he describes the industry where he says, quote, first sentence, "In a sense, the tobacco industry may be thought of as being a specialized, highly ritualized and stylized segment of the pharmaceutical

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industry. Tobacco products uniquely contain and deliver nicotine, a potent drug, with a variety of physiological effects."

See that, sir?

A I see that.

Q All right. And is it your view, as well, that nicotine is a drug?

A Well, I think in tobacco nicotine is not a drug, at least under the current definition. Obviously, if one isolates nicotine and uses it in smoking cessation devices or as a gum or by other means, then it can be classified as a drug. So I think it entirely depends, and I think that's the government construct.

Let's look at caffeine. Caffeine in coffee is not considered a drug, but if caffeine is isolated, purified and used as pills, or in pills, it can be a drug. And can be, in fact, regulated by the government or can be an over-the-counter drug.

Q Dr. Townsend, you talked about let's look at the government construct. You're aware, are you not, that the government, the FDA, found that manufacturers of cigarettes knew that nicotine in their products caused

pharmacological effects, including addiction to nicotine and designed cigarettes to support that addiction?

MR. WAGNER: Objection, Your Honor. Counsel is reading from a document. It's hearsay. It's not this document -- not this witness' document, Your Honor.

MR. WESTBROOK: Your Honor, this is the FDA findings which is in evidence. I'll hand it --

MR. WAGNER: I understand it's in evidence.

THE COURT: In evidence?

MR. WESTBROOK: Yes.

MR. WAGNER: But that doesn't mean he can read to this witness from every hearsay document that's been admitted into evidence and ask this witness questions about it, Your Honor.

MR. WESTBROOK: It's in response to his statement.

THE COURT: I think the last question was a fair question.

Overruled.

A I'm sorry, can you point me to the correct

passage and ask the question again.

Q Yes, sir, Doctor. I'm on page 2 of the FDA Findings of Fact. Paragraph 2, the number 2 there, the second number 2. Go down, if you would there to 3. Do you see 3 begins "Manufacturers"?

A Okay.

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Q "Manufacturers of cigarettes and smokeless tobacco know that nicotine in their products causes pharmacological effects in consumers, including addiction to nicotine, and mood alteration, and that consumers use their products primarily to obtain the pharmacological effects of nicotine."

You agree that smokers want nicotine in cigarettes or they won't buy them. Don't you agree with that?

A What I've already said is that if we -- if we manufacture products that have exceedingly low levels of nicotine, they're not consumer accepted. However, I think we have some products on the market, like Now and Carlton, that have low levels. They have marginal consumer acceptability. I do think that nicotine is important to the

overall smoking process. No question about it.

Q You'll agree with paragraph 4 then, I take it?

A Wait a minute.

Q Let me read it to you: "Manufacturers of cigarettes and smokeless tobacco design their products to provide consumers with a pharmacologically active dose of nicotine."

Do you agree with that?

A That's a frequent allegation against the industry. My experience at Reynolds has been -- leads me to completely disagree with that. I think we at Reynolds have, in product development, we have target tar levels in the design of our products and we know that nicotine level, for a given tar level, nicotine has to be within a fairly narrow range to be consumer acceptable. That's the practical experience that we have.

Also, I don't know what -- to use -- also, I don't know, to use these words, "a pharmacologically active dose of nicotine," I don't know what that is.

Q Dr. Townsend, did RJ Reynolds use genetically-engineered tobacco with increased nicotine levels in its cigarettes?

A In its commercial cigarettes?

Q Answer that first, in its commercial cigarettes.

A I'm just trying to narrow down your question.

Q That's fine. I'll take that clarification.

A In its commercial cigarettes, I don't know of any case where RJ Reynolds has used genetically-engineered tobaccos in commercial products.

Q Did RJ Reynolds use genetically engineered tobaccos in cigarettes that it didn't put on the market?

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A We have done a variety of experiments with genetically-engineered tobaccos for a variety of reasons. Some of the genetic engineering that's occurred in the past, and some of it, frankly, is going on around the world in various laboratories, not necessarily RJ Reynolds, to look at genetic modification to improve pest resistance, so that farmers actually have higher yields

without problems from pests or bugs. There are other attempts to design genetically modified tobacco to increase nicotine levels in the tobacco. There have also been attempts to reduce nicotine levels in tobacco.

Q And, Doctor, finally, on the FDA findings, the fifth finding of the FDA, "An inevitable consequence of the design of cigarettes and smokeless tobacco to provide consumers with a pharmacologically active dose of nicotine is to keep consumers using cigarettes and smokeless tobacco by sustaining their addiction to nicotine."

I take it, Doctor, you disagree that smokers are addicted to nicotine.

A I'm not an expert in addiction, obviously. I think addiction means different things to different people. And if you mean by addiction that people cannot quit smoking, I think then I don't agree with you. Because people are quitting smoking in record numbers.

If by addiction you mean it's a habit, and can be difficult for people to quit,

then I probably do agree with you.

Q Doctor, you said, and I'll ask you because you said it, that people are quitting smoking, that indicates to you that nicotine is not addicting. People quit heroin, but that doesn't mean it's not addicting, does it?

A Well, again, I'm not an expert in the area of addiction. The classical definition of addiction, from the World Health Organization, included a number of factors, including increased use, or increased dose over time. Common thing for alcohol abuse or for heroin or cocaine use. The constant need for increased dose.

There was also anti-social consequences or behavior that resulted from it. People trying to feed that addiction through crime. There were a number of issues.

And again, I'm not an expert in this area, but certainly the definition of addiction has changed dramatically over the years to where in common parlance today pretty much anything is addictive, whether it's Internet or chocolate, there's a number

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of things.
Q You agree with -- you disagree with the FDA which has studied this issue and concluded that nicotine is addictive. You just disagree?
A I'm telling you, and I think I've explained the answer to this question in my previous answer. I think cigarette smoking is clearly a habit. I don't agree that it's an addiction in that charged way that term is used. I think the word addiction means different things to different people. And so I think I've -- I've explained as clearly as I can what I believe.
Q Now, Doctor, I want to talk to you about Premier and Eclipse. Was Premier ever offered for sale in Marion or Muncie, Indiana?
A No.
Q Was Eclipse ever offered for sale in Marion or Muncie, Indiana?
A Not yet. I hope it will be.
Q And the Winston Select, that lower nitrosamine cigarette, I think we've established, that was never offered for sale

in Marion or Muncie, Indiana?
MR. WAGNER: Asked and answered, Your Honor.
THE COURT: Sustained. He answered that.
Q Is it true, Dr. Townsend, that Premier was patented as a drug delivery device as well as a cigarette? Was it patented as a drug delivery device?
A I heard your question. I think that there were a variety of patents on Premier. There were probably more than 40, as I recall. Some of the patents, probably one or two that I can recall specifically, did speak to the design as a potential drug delivery device.
I think that in writing patents, one tends to try to get the broadest coverage you can.
Certainly the Premier design with a heat source in the front and a capsule that can contain pretty much whatever you want it to contain and deliver an aerosol, certainly could be conceived as a drug delivery device if it didn't contain tobacco. If it

contains tobacco, then legally it's a cigarette.
Q The reason it was patented as a drug delivery device is because it was delivering nicotine?
A No. I disagree. The reason it was patented as a drug delivery device is because we felt

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that that particular technology of combining a heat source with a capsule might be -- have broader application in the pharmaceutical industry. So I disagree with you completely.

Q Doctor, you said on direct that you didn't think you had the capacity to manufacture the Eclipse cigarette before you finally did; is that right? It couldn't have been done before?

A I think this is an evolution. We learned from Premier and from the failure of Premier that obviously fed into the development of Eclipse.

Q Let me show you a Reynolds advertisement for Eclipse called "Eclipse, The Inside Story." Dr. Townsend, do you recognize the Eclipse product discussed in this advertisement as

the Eclipse that you discussed on direct examination with counsel?

A Yes, I do.

MR. WESTBROOK: Your Honor, we would offer this Eclipse advertisement into evidence as the next exhibit.

MR. WAGNER: No objection, Your Honor.

THE COURT: 107 will be admitted.

(Plaintiffs' Exhibit(s) 107 received in evidence.)

MR. WESTBROOK: Your Honor, may I pass copies to the jury?

THE COURT: Sure.

Q Dr. Townsend, if you would, please, sir, would you turn to the fourth page of the document which shows the diagram of the Eclipse cigarette.

A I see it.

Q And just to run through the diagram, I see there's a filter, then there's a tobacco roll. Are there additives in that tobacco roll?

A Yes, there are.

Q And then there's a high purity carbon tip.

What's a carbon tip?

A That's the heat source that we talked about earlier.

Q And it says and heat barrier. What's the heat barrier?

A Well, the heat barrier is the insulation, the glass mat insulation that's around the outside of the carbon heat source.

Q And what's the filter material made of?

A For Eclipse it's cellulose acetate.

Q The filter is not very functional, is it?

A It's a pretty low efficiency filter.

Q Basically it has something that looks like a filter.

A It removes small amount of the tar but not very much.

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Q So you've got a filter, tobacco, carbon, and glass mat; correct?
A Well, there are other pieces too that are not described here, but that's essentially correct.
Q What are the other pieces? The paper wrap?
A Inside the -- inside the cigarette around the front segment, and if you'll remember this morning, I said that there were two

different types of tobacco sections, segments. There was a tobacco substrate, which is roughly half of this material, up next to the heat source. There was a tobacco roll, or -- on the backside, which is roughly the half. On the inside of the paper, on the front half, which is the substrate, next to the heat source we've got an aluminum foil inner wrapping material that's laminated onto the inner piece of that cigarette.

There's also, as I described this morning, a piece of -- a small piece of reconstituted tobacco that's placed in the glass mat insulation that wraps around the heat source. That tobacco is burned to try to improve taste characteristics.

There are a number of different combining wraps that are not shown here as well.

Q What are they made out of?
A The combining wraps?
Q Yes.
A Well, there's just various types of papers with different burn characteristics.

Q Is the glass mat some kind of a fiberglass mat?
A It is an extruded glass mat. It's not fiberglass really. We sometimes refer to it as that, but it's not fiberglass, per se. It's a carefully manufactured and carefully chosen glass mat.
Q So we have a filter. What was the ingredient the filter is made out of again?
A This particular filter is cellulose acetate.
Q Cellulose comes from wood?
A Wood pulp.
Q Wood pulp. What does acetate mean?
A The wood pulp -- the cellulose from the wood pulp is refined, it's processed by the supplier, and then acetic acid is added to acetylate the cellulose, and so you actually have an acetylated version of cellulose which has better properties for extrusion in the fibers.
Q So it could be pulled into fibers better?
A Well, it's spun into fibers.
Q So filtered tobacco, carbon, aluminum, paper, and glass mat. Any other ingredients?

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A That's generally it. As you pointed out, there are some additives on the tobacco substrate.
Q Now, in this advertisement to the public, you represented how it's made. "It's Simple." Correct?
A That's what it says here.
Q Reynolds advertised, "It's Simple."
A That's what it says here.
Q Now, as early as 1969, Dr. Townsend, isn't it correct that Reynolds scientists had suggested devices that would look like a cigarette but would deliver glycerin and flavors out of the end? Have you seen those documents in your searching?
A I've seen some. It certainly has been the subject of a number of investigations, explorations. I think it's been the subject of even some patents outside of Reynolds.
Q Let me hand you a document dated September 19, 1969, from Dr. Murray Senkus and Edward Vassallo. Do you recognize those names?
A I know Dr. Senkus, not well.
Q Approval of a new consumer oriented business strategy for RJR. Based upon an analysis of

the effects of the smoking and health controversy and the safer cigarette strategy on consumer behavior.
Doctor, you say you knew Dr. Senkus?
A Not well, but I did.
Q Was he in research and development?
A Yes, he was.
MR. WESTBROOK: Your Honor, we would move the introduction of the September 19, 1969 memorandum from Dr. Senkus and Vassallo.
THE COURT: Mr. Wagner, any objection?
MR. WAGNER: I need a minute to read these 15, 20 pages, Your Honor.
THE COURT: All right. Go ahead.
MR. WESTBROOK: It's Exhibit 9580 for the record, Your Honor.
THE COURT: All right.
Q Dr. Townsend, if you would, take a look at the --
THE COURT: Well, we're not going to talk about it until he has a chance to see it.
MR. WESTBROOK: I misunderstood

your go ahead, Your Honor.
THE COURT: My fault.
MR. WAGNER: No objection, Your Honor.
THE COURT: All right. 9580 will be admitted.
(Plaintiffs' Exhibit(s) 9580 received

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in evidence.)
THE COURT: Go ahead, Counselor.
MR. WESTBROOK: Your Honor, may I have copies passed to the jury?
THE COURT: Yes.

Q Doctor, what comes out of the mouth end of the Eclipse? What are the components of that smoke that comes out of there?
A As I described earlier this morning, there's roughly, depending on which style you choose, 3 milligrams or 2 milligrams of total material, total particulate material. Of that 2 or 3 milligrams, approximately 75 to 80 percent of the smoke is glycerin.
Q Glycerin. Okay, what else?
A And about 20 to 25 percent of the smoke is tobacco combustion products.
Q And what would that consist of?

A Well, a large collection of many constituents, like we've been talking about for the last day and a half.
Q Would nicotine be in there?
A Nicotine would be part of that.
Q Would there be water vapor?
A There would be quite a lot of water. Except really the water and glycerin are combined together. So nicotine and tobacco combustion products would represent the other piece of that fraction, that pie.
Q Are there any flavorings in the Eclipse to come out?
A Sure.
Q Then whatever else would come out of the -- would you take a look, sir, at the document three pages in from the end where Drs. Vassallo and Senkus of Reynolds in 1969 drew their ideas. You see where their idea, sir, was to have something that looked like a cigarette, and would let nicotine, flavors, water, et cetera, come out of the mouthpiece end?
A Which one are you referring to? No. 2.
Q The first one is tobacco and then right

under that is one that would have no tobacco. It would have a pressurized aerosol generator with nicotine flavor and water along with a simulated coal ash; correct?
A That's what it says here.
Q Now, Doctor, it's true, is it not, that a lot of the design ideas that are contained in this 1969 document are the types of ideas that went into Premier and Eclipse?
A I think ideas build on one another over time and eventually get to a critical mass where things make sense and you know how to do it. I see this Item No. 2, transitional no tobacco. First of all, there's no tobacco in it, so it's not a cigarette.

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Second of all, it certainly is an idea worth considering. But it has a pressurized container to generate a smoke. You know, how to reduce that to a consumer article is, you know, is probably a question.

But I think, you know, I think there are many ideas, some of which do dovetail into the ultimate generation of a practical workable idea.

Q And, Doctor, have you seen the next research report that addresses this design proposal?
A The next research report?
Q Yes, sir.
A Possibly. I don't know which one you're referring to exactly.
Q Well, in your going back through the Reynolds literature and the documents, did you come upon this document when you were reviewing the documents?
A Oh, where this idea was reduced to practice?
Q No. I'm asking have you seen the next in a series of reports about this idea; have you seen these?
A Where this idea or a continuation of this discussion by Dr. Teague; is that your question?
Q Well, I don't know about Dr. Teague. This is Senkus and Vassallo.
A I'm sorry. I was back on the previous document. Okay, Senkus. This is actually a Teague memorandum, it's written to Senkus and Vassallo. If you look on the last page, Claude Teague has a signature there.
Q Okay. Thank you, sir. Now, have you seen

the next report about this project?
A Well, I don't take this as a project, frankly. I think this is, in fact, an idea paper. Obviously, Dr. Teague sat back and said, okay, here are some of the issues around smoking, developing a safer cigarette as a viable approach to take, and he said that way back in 1969. That's a viable approach to take. Here's some of my ideas about what's important to consumers; and by the way, here's a couple designs that might make sense.

I'm not aware that he wrote a follow-up document to this. I think these were certainly Dr. Teague's opinions on an approach to a safer cigarette strategy.

I do also think that it's -- that this was written -- if you look in the acknowledgments, he's indebted to the faculty of the executive program at the University of North Carolina for stimulating his interest in this area, and in particular to his advisor there, Dr. Rehder, who provided encouragement, special assistance in the area of behavioral science and

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strategic planning.
Dr. Teague took an executive management program at the University of North Carolina, and when he came back, one of the things he wanted to do was actually lay out a long-term business strategy. And I think this was the result of that.

Q Okay. From 1969, sir, was Premier the first product that Reynolds put out that looked like a cigarette but didn't burn tobacco?

A Premier was the first cigarette that Reynolds marketed that did not burn tobacco. It was a cigarette. It not only looked like one; it was one.

Q And what year did Premier come out?

A Premier was test marketed in 1988.

Q So between 1969, it was about 18 years till Premier came out?

A Right.

Q Now, and then Eclipse was what year?

A Eclipse was launched in 1996, I believe.

Q Doctor, let me show you Exhibit 26414, which is in evidence. Doctor, this is another Reynolds research report authored by a Dr. John Reynolds. I think you identified

him earlier as somebody who you knew?

A I know Dr. Reynolds.

Q And this is entitled, "Artificial Smoking Article." Correct?

A That's the title.

Q Am I correct that on direct examination, you stated that Reynolds started working on what became Premier in 1981?

A The Premier project, as I recall, started in 1981. There were a number of idea generation sessions that extended back into 1980, as I recall. But the project itself really got off the ground, as I recall, in 1981.

Q Had you seen this document before in your review through the historical Reynolds archives, sir?

A No, I hadn't seen this in my review of the Reynolds archives.

Q If we could, take a look, sir, at the -- again, I think it's three pages in from the end.

MR. WESTBROOK: Your Honor, this is on evidence. May I put it on the screen?

THE COURT: Go ahead.

Q Doctor, let's look at the --

A May I finish skimming this, please?

Q Sure.

A Okay.

Q Let's look at the diagram. I think it's three pages in, of this 1976 document. I think there are two cigarette like articles.

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And I see that the drawing has a heat source, it seems to say as charcoal or catalytic burner. Heat source at the tip; correct?

A It says, "Heat source, such as charcoal or catalytic burner."

Q Okay. Now, Eclipse and Premier had a heat source at the tip as well, didn't they?

A They did. It was carbon.

Q And then he's got a section in the middle, it says, "Heat pipe or other conductor"; correct?

A It says, "Heat pipe or other conductor."

Q And then it's got a flavorant loaded reservoir down there near the smoking end; correct?

A That's what it says.

Q I believe that Premier you broke open for

the jury had a flavorant type of reservoir with little capsules in it, sprayed with some flavorings?

A Well, it had an aluminum capsule. The capsule contained alumina pellets or spears, and on the surface of the alumina pellets was tobacco spray dried materials.

Q Take a look at the first page of the document where Dr. Reynolds talks about why he's proposing this article. Under "Summary," the second paragraph. "A present trend of anti-smoking propaganda is to make smoking appear to be a dirty habit. The present conception offers a means to supply the smoker with what he or she wants in a clean, elegant and non-polluting manner." Correct?

A That's what it says.

Q When I handed you this document today, Doctor, is that the first time you've seen it?

A No, it's not the first time I've seen it.

Q Turn over to page 3 of the document where Dr. Reynolds gives his findings, paragraph 3. "The technology to produce the heat

source, heat pipe and flavor reservoir exists now."

Is that what Dr. Reynolds says?

A That's what he says.

Q Were you involved in this project when you arrived at Reynolds?

A No, I don't think this was a project, frankly. My interpretation of this document is that it's an idea disclosure. Our scientists, when they come up with new ideas, are encouraged to, in fact, write their ideas down in a document form like this which then goes into the library, and is also circulated to other scientists to try to generate their ideas, because scientists spin off ideas from one another,

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so that's the purpose of this. I think it's a misconception to think that this was a project.

Q Dr. Reynolds said the technology existed at that time; correct?

A What he said was the technology to produce the heat source, heat pipe and flavor reservoir exists.

Q Now, Doctor, it's true, is it not, that up

until today, Thursday afternoon at 4:05, there is no American consumer who can find out from Reynolds the specific additives that are in any package of cigarettes. Isn't that true?

A If your question is can a consumer find out specifically what is in the additives, or what additives are in a specific cigarette brand, the answer is, well, no, that's proprietary, that's trade secrets among each of the companies. The companies have, however, provided full lists of all the ingredients used in products in the United States to the Department of HHS since the mid-'50s. We've made that list public since 1994.

Q Excuse me, Doctor, did you mean to say the mid-'50s?

A I'm sorry, mid-'80s. Did I say mid-'50?

Q You did.

A I'm sorry. 1985 to be specific is when we released the first list to the Department of Health and Human Services.

Q Now, the list that you talked about is not a list of the additives that go into Winston.

It's a list of 599 or so substances that may be in some cigarettes somewhere. Isn't that what the list is?

A I think I testified exactly to that yesterday. That's not a revelation. I told this Court that it was an industry-combined list.

Q So the government, from that list, can't tell what additives are in Winston? Can it?

A Not from that list.

Q A lot of other products in this country have their additives and flavorings listed, don't they?

A Well, I think some do, in different ways.

Q I just happen to have in the hotel a Hershey's Kisses bag, empty.

MR. WESTBROOK: Your Honor, may I approach and show the witness?

THE COURT: Go ahead.

Q The Hershey's folks don't seem so concerned about telling people exactly what's in Hershey's Kisses, do they? They list them A to Z there, don't they?

A Well, there is a listing here, and it says --

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THE WITNESS: If I may read it, Your Honor?
Q Sure. Please do.
A It says, Ingredients: Milk chocolate. Milk chocolate contains sugar, milk, cocoa butter, chocolate soya lecithin, an emulsifier, vanillin, and artificial flavoring.
So what they've done is taken artificial flavors, lumped that into a category called artificial flavors. I don't know what that category includes.
Q Doctor, it doesn't say it contains vanillin and artificial flavoring. It says it contains and "vanillin, an artificial flavoring." It identifies the flavoring. It's A-N, not A-N-D, isn't it?
A I'm sorry, I misread that.
Q They tell you exactly what's in it.
A Okay. I think in a -- okay.
Q And you folks don't tell anybody anything that's in it. List -- find, if you can, on that Camel, if you would, sir, one ingredient that's listed.
MR. WAGNER: Judge, you know, we've

been over this at least five times already. I object, it's repetitious, it's been going on now for 15 minutes. It's been asked and answered. The witness has explained this at least five times.
THE COURT: He has answered that question.
Q Doctor, in light of the hour, I'm trying to save us both a little time, so give me a minute.
Now, Doctor, you've talked on direct about the work of the Reynolds research department over the years and the efforts that you've made. It's true, is it not, Doctor, that the amount of money that Reynolds spends on research is dwarfed by the amount of money it spends on advertising cigarettes to get people to buy them. That's true, isn't it?
A I think it's fair to say that our marketing and advertising budget is larger than the research and development budget. We have a large research and development budget. I think we've got sufficient funding to do what we need to do, what we are doing.

I think, on the other hand, any consumer product that's marketed at retail in the way cigarettes is marketed, be it cereal or whatever, certainly has a large marketing budget. That's not a surprise.
Q All right. Let's look at a -- since, let's say, 1991, Doctor, has your research budget

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been increasing or decreasing at Reynolds?
MR. WAGNER: Judge, I object to this. This is irrelevant. Hasn't anything to do with the issues in this case, has nothing to do with this witness' direct examination.
MR. WESTBROOK: Your Honor, I think it does. It goes to the effort Reynolds is putting into research, if their budget is being cut in light of all these concerns about environmental, I think it's very relevant.
THE COURT: I think, Counselor, it's outside the scope. We heard this yesterday. Let's move on.
Q Doctor, you talked about Dr. Wynder a lot on direct. And Dr. Wynder is a medical doctor; correct?

A That's correct.
Q And you talked about Dr. Wynder would say something and then you'd do something. Doctor, where were the Reynolds medical doctors exploring these issues and making these recommendations? Where are the Reynolds' epidemiological studies on smoking and health? Where are those things?
MR. WAGNER: Objection, Your Honor, argumentative.
THE COURT: Overruled. You may answer that.
A Reynolds has funded quite a lot of medical research. It's funded -- and actually, our scientists have worked with epidemiologists. Are we conducting or have we conducted experimental epidemiology? I don't think so. However, we've looked to the epidemiologists for information just as we've looked at the medical research field for information and also for guidance to the extent that it can provide it.
We do undertake extensive biological research, both in trying to understand the effects of tobacco smoke in different animal

systems as well as different test tube systems. We've conducted a lot of research, but we do interact very closely with the medical research field.
Do we do a lot of medical research with humans inside Reynolds? No, of course not. Because the experts are out there at the universities, and we look to them, we work with them, and we talk with them.
Q Doctor, can you tell me what epidemiological studies on smoking and health Reynolds has performed or sponsored?
MR. WAGNER: Asked and answered, Your Honor. He just answered that question.
MR. WESTBROOK: I don't think he did, Your Honor. He said sponsored a lot of

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research.
THE COURT: He can tell us if there are any.
Are there any?
THE WITNESS: I'm not aware of any studies at Reynolds that Reynolds has conducted epidemiological studies, and I think I did answer that question once, Your Honor.

Q Now, Doctor, it's true, is it not, that Reynolds has never given any nonsmoker in this country a warning about environmental tobacco smoke from Reynolds' cigarettes? That's true, is it not?
MR. WAGNER: Objection, Your Honor. Assumes a fact that there's no support for.
THE COURT: Rephrase your question.
Q Has Reynolds ever put a warning on any of its packages or any of its advertisement about environmental tobacco smoke and its potential effects on nonsmokers? Has Reynolds ever done that?
MR. WAGNER: Objection, the same objection, Your Honor, plus the fact it's preemptive.
THE COURT: Overruled. You may answer.
MR. MOTLEY: Your Honor, can we approach for one second?
THE COURT: You won the argument.
MR. MOTLEY: No, no, about something else.
THE COURT: All right.
(Bench discussion)

Q Doctor, I'm going to ask you --
MR. MOTLEY: Let us sit down.
MR. WESTBROOK: It's going to take a few seconds to ask it.
BY MR. WESTBROOK:
Q Doctor, I'm going to ask you this question, and this is a question which I'd like to give you -- like you to give a yes or no answer. Do you understand that, sir?
A If I can, sir.
MR. MOTLEY: Your Honor, we want a yes or no answer period.
THE COURT: I know what the question is, Doctor, and you can answer it yes or no.
THE WITNESS: Thank you, sir.
Q Dr. Townsend, has Reynolds ever given any nonsmoker in this country a warning that ETS could be hazardous to their health? Yes or no?
MR. WAGNER: Same objection, Your Honor, for the record.
A Not that I'm aware of.
MR. MOTLEY: Judge, we need to -- I didn't know he was done, or I would have

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brought this up when I was up there. We need to approach on the matter we left hanging yesterday that you took home with you last night.

THE COURT: All right. Approach.

(Bench discussion)

THE COURT: The offer of 30861 is going to be declined to be admitted at this point.

(Plaintiffs' Exhibit(s) 30861 not received in evidence.)

Go ahead, Mr. Westbrook.

MR. WESTBROOK: Dr. Townsend, that's all I have for you right now. Thank you, sir.

THE WITNESS: Thank you.

THE COURT: Thank you, Counselor.

Mr. Wagner, any redirect?

MR. WAGNER: Yes, Your Honor.

REDIRECT EXAMINATION

BY MR. WAGNER:

Q Dr. Townsend, I'm going to try to be very brief here, as brief as I can.

MR. WESTBROOK: Some of your exhibits are over here.

Q Since I at least have a rather short memory, I want to start with the last subject and then sort of work backwards. Just to clear some things up first of all about additives. Mr. Westbrook asked you about whether there were disclosure of specific additives in specific brands; right?

A I remember that question. I think that's right.

Q But there is, in fact, lodged with the Office of Health and Human Services and has been since, what, the mid-'80s or so --

A 1985, as I recall.

Q -- a list of all the additives used by all the tobacco companies in all their cigarettes; right?

A That's correct.

Q So if anybody wanted to examine whether or not any of those additives had any special qualities or lack of special qualities or harmful effects, they're all there for anybody to look at; right?

A Well, I don't know there are any restrictions placed on the HHS list that's been in 1985. We have made that list public

in 1994, a public release of that information, 599 different ingredients.

Q And prior to that time, however, the Office of Health and Human Services could have done that; right? Could have analyzed anything on the list?

A Well --

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MR. WESTBROOK: Objection, Your Honor. Leading.
MR. WAGNER: Your Honor, I'm just trying to move it along a little bit.
THE COURT: Go ahead.
A My understanding is that the Department of HHS did take the list, did examine it. I think a number of people have looked at that list, certainly a lot of people have looked at the public list.
Also my understanding is that there haven't been any scientific attacks on any of the constituents on the additives list.
Q And the reason that Reynolds and the other tobacco companies don't disclose what is in particular brands of cigarettes by way of additives is because they consider it to be proprietary; isn't that so?

A Absolutely.
Q A trade secret; right?
A Absolutely.
Q Like how Coca-Cola is made, what goes -- what makes up Coca-Cola; right?
A That's correct.
Q Now, you were asked about the John Reynolds' document that -- maybe I can give you these both together, and also the article by Murray Senkus. You still have those up there?
A Yes, but Senkus didn't author that. It was Claude Teague that authored that, sent that to Murray Senkus.
Q Yes.
A But I do have them right here, I believe.
Q Okay. Now, the article by John Reynolds is dated in March of 1976, wasn't it?
A That's correct.
Q The Premier lab work, I believe, was started when? 1981?
A 1981 is when the project started as I recall.
Q Now, in your business, would it be fair to say that there are lots of ideas that never

reach fruition?
MR. WESTBROOK: Objection, Your Honor, to the constant leading.
MR. WAGNER: Okay. I'll withdraw it. I'll rephrase.
Q Are there lots of ideas in your business?
A There are always lots of ideas in my business.
Q Do they all reach fruition and turn into products that are commercially acceptable out in the marketplace and technologically feasible to produce?
A By far most of the ideas that are developed by our scientists fall by the wayside for one reason or another.
Q And with respect to these two ideas that

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were in these two papers that you were questioned about, no one actually tried to develop those specific designs, I take it; right?

A I'm not aware in either case of an attempt to reduce either of these ideas to practice, as they're described here.

Q And earlier you told us what it took to develop Premier. Do you remember that?

A Yes.

Q And how much money was spent in order to do that?

A Yes, as I recall, it was hundreds of millions of dollars.

Q And you had to develop new technology?

A Yes.

Q And you had to find and manufacture new kinds of equipment so that the Premier could be, in fact, produced; is that right?

A To develop --

MR. WESTBROOK: Objection, Your Honor. Every question is leading.

MR. WAGNER: Okay. I'm just trying to move it along, Your Honor.

THE COURT: I know you are, Counselor, but --

A To develop Premier we had to develop new manufacturing systems from ground up, we had to develop new materials that weren't used in not only tobacco products but in some cases like the alumina substrate beads were a very new material. We had to develop a special machine just to insert the fuel source, or the heat source, into that little

capsule without breaking it. A tremendous technical challenge.

Q And after all those technical innovations and after all that money was spent, what happened to Premier?

A It failed in the marketplace because it lacked consumer acceptance.

Q Now, that FDA document that was read to you. Do you remember that?

A Yes. I have it.

Q Do you know what that document is?

In fact, may I see it for just a second?

A I'm not sure what this document actually is.

Q In fact, if you read, I believe, Dr. Townsend, the very first sentence on the very first page.

A The very first sentence says, "This document explains the basis for the Food and Drug Administration's assertion of jurisdiction over cigarettes and smokeless tobacco under the Federal Food and Cosmetic Act (The Act)."

Q And that document contains a lot of assertions by the FDA because that's exactly

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what they were trying to do; right?
A Well, my general understanding of what was going on at that time period was FDA was certainly trying to assert jurisdiction over cigarettes.
Q So what was read to you was really words out of a brief and an argument to that end; isn't that right?
A I think that would be a reasonable assumption based on the way this document starts out.
Q And do you have Plaintiffs' Exhibit 7578?
A If you can tell me what it is.
Q Entitled "Research Planning Memorandum."
A Yes. Yes, I have it.
Q Now, this was also read to you about nicotine. Will you turn to the second page.
A Okay.
Q You see the last paragraph on that page?
A Okay.
Q Now, it says there, and see if I read this correctly, "That habituated user of tobacco products is said to derive satisfaction from nicotine, although much study, the physiological actions of nicotine are still

poorly understood and appear to be many and varied. For example, in different situations, and at different dose levels, nicotine appears to act as a stimulant, depressant, tranquilizer, psychic energizer, appetite reducer, anti-fatigue agent or energizer, to name but a few of the varied and often contradictory effects attributed to it."
Did I read that accurately?
A You read that accurately.
Q Now, you were asked a lot of questions about the FTC method. Do you remember that?
A Yes, sir.
Q Did RJ Reynolds Tobacco Company develop the FTC method?
A No, sir, the FTC did.
Q And who is the FTC?
A The U.S. Federal Trade Commission.
Q And is RJ Reynolds Tobacco Company required by law to test its products using the FTC method?
A We are required to provide to the government FTC measured tar and nicotine and carbon monoxide for every product that we sell.

We're also required by the Federal Trade Commission to place tar and nicotine numbers on all advertising and marketing materials.
Q And is the use of that method how the tar and nicotine numbers that appear on the side of a cigarette package are, in fact, developed?

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A Well, that's exactly correct. The FTC protocol for tar and nicotine measurement, which is FTC established in 1967, is the basis for the measurement of all those numbers. We -- the current way this works is each company will provide to the FTC a listing of all of its brands and all the numbers associated with those brands, and the government also checks behind to make sure they agree.

Q And I think you've already testified, have you not, that it doesn't necessarily affect what an individual smoker will always get when he smokes a cigarette in terms of tar and nicotine; right?

A The FTC, it's clear, never intended for the FTC test method to represent what any individual smoker gets. It was intended to

provide useful information for comparisons in the marketplace.

Q And is it, in fact, in your opinion, a valid way to compare yields across brands?

A I believe it's a valid comparison, yes.

Q And if we look, for example, at this sales weighted chart that you demonstrated to the jury earlier in your testimony today, what if you used a different measure starting out here, back in 1954, but you used the same measure at all times for tar and nicotine as you moved across time. Would you still get the same relative difference?

A Let me make sure I understand your question. If you're asking what would that plot look like if instead of a 35 milliliter puff taken once a minute, we had chosen something else, maybe 45 milliliter taken once every 30 seconds, the chart is still very -- is relative.

So the entire chart would shift up if we had chose those conditions. But the relative differences, from year-to-year, would still remain the same. Just as the relative ranking of cigarettes in the

marketplace, it's pretty much the same regardless of the test method. The test method will just shift the numbers up or shift the numbers down.

Q And so if you wanted to compare percentages of reduced yield of tar and nicotine, for example, you'd reach the same percentage, would you not, over time?

A It's a comparative measure and you could still do that.

Q Let's talk about sidestream smoke and environmental tobacco smoke for just a minute. Doctor, is sidestream smoke environmental tobacco smoke?

A Sidestream smoke is not environmental tobacco smoke. Sidestream is the fresh

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smoke emanating from the side of the cigarette. Environmental tobacco smoke is, in fact, that sidestream smoke which has been diluted into a large area, generally a room like this, and aged, and there's a lot of chemistry that goes on during that aging period. And also includes exhaled mainstream smoke, the smoke that smokers exhale.

Q And I want you to assume that Drs. Ogden and Jenkins testified in this case that sidestream smoke measurements don't tell you very much at all about ETS exposure. Would you agree with that?

A I'm not an expert in this area. Qualitatively as a scientist, as a chemist, I think that's a reasonable conclusion.

Q So do you have Plaintiffs' Exhibit 14398 up there, the R & D long range planning document?

A Yes. I have it.

Q Let's turn over to page 14, I believe it is.

A Okay.

Q So when you were read there in paragraph A at the top that the levels of some components in the sidestream are about three times the level in the mainstream smoke, for others the ratio of sidestream:mainstream levels may be as high as 10 or 15, that's not talking about environmental tobacco smoke, is it?

A It says specifically sidestream to mainstream ratios, not ETS.

Q And, Doctor, did you know that the levels of

the components that are referenced there have all been published in the 1979 Surgeon General's Report?

A It's been a while since I read the '79 Surgeon General Report. I know a number of constituents have been reported there. I think the ones that are specifically named, as I recall, probably are.

Q And once again, in the article Formation and Analysis of Tobacco-Specific N-nitrosamines; do you have that article?

A Yes. Okay.

Q Plaintiffs' counsel questioned you about the table that appears on page 130. Can you find that?

A I've got it.

Q All of the numbers that are there in table 6 that relate to nitrosamines, are they all in nanograms?

A These are nanogram quantities, all of them.

Q And once again, is what's being referenced there environmental tobacco smoke or sidestream smoke?

A The title says, "Tobacco-Specific Nitrosamines in Sidestream Smoke."

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Q So that's not environmental tobacco smoke either, is it?
A No, sir.
Q And you were questioned also about this article by Dr. Wynder, "The Place of Tobacco and the Etiology of Lung Cancer."
A Yes. I don't think it's in this stack, though.
Q Okay, Doctor, let me, just to move this along, let me hand you my copy. And this was an article written by Dr. Wynder in 1954 in a publication called Lung Cancer. Would you read the bracketed material, please, on page 325.
A Page 325, "Evaluation of Clinical Statistical Association. In view of the fact that clinical statistical data are often poorly prepared, assembled and analyzed, the medical profession has long doubted the value of purely statistical associations. Even well-planned and conducted statistical studies may have inherent errors that could lead to erroneous conclusions because of certain statistical fallacies."

Q And then you were asked some questions about Dr. Hoffmann; right?
A That's correct.
Q Let me show you an article that was written by Drs. Wynder and Hoffmann.
MR. WESTBROOK: Objection, Your Honor. I didn't go into this article on cross-examination.
MR. WAGNER: He went into a lot of statements by Dr. Hoffmann, Your Honor. And I'm about to demonstrate what Dr. Hoffmann said about environmental tobacco smoke along with Dr. Wynder, something that is particularly relevant to this case.
MR. WESTBROOK: Your Honor, I referred to Dr. Hoffmann on particular articles. This was not an article on cross-examination.
MR. WAGNER: Well, I didn't go into a lot of articles with the witness on my direct examination, either, Your Honor.
THE COURT: Let me hear your question, Mr. Wagner.
BY MR. WAGNER:
Q Do you recognize that? First of all,

Dr. Townsend, if you look down in the footnote area in the lower left-hand column on the first page, you see it was received on November 30, 1993, and accepted August 16, 1994?
A That's what it says.
Q See that? So this was an article published

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in 1964 by Drs. Wynder and Hoffmann; right?
A Yes, Hoffmann.
MR. OHLEMEYER: '94.
Q I'm sorry, did I say -- in 1994?
A 1994, it was received in 1993.
Q Okay. And what's it entitled?
A The title of this article is "Smoking and Lung Cancer Scientific Challenges and Opportunities."
Q Okay. And would you read out loud, please, the first paragraph after the word "Introduction"?
A Yes. "Cigarette smoking has been conclusively established as the leading cause of lung cancer in men and women (Reference 1 to 3). The progress made in our understanding of the epidemiology of smoking and lung cancer and the delineation

of major mechanisms of tobacco carcinogenicity or genesis (Reference 3 to 5) may have given the impression that future research is no longer needed and that all that remains to be done is the effective application of preventive measures. This impression requires revision because several key questions on smoking and lung cancer are still awaiting answers."
Q Dr. Townsend, just to move this along a little bit, you see in the next paragraph, then, the authors say that "In this overview, we will discuss some of these unresolved issues"; do you see that?
A That's what it says.
Q Then it says, "They conclude," then if you look at subparagraph c, it reads, "The debated issues on the association between passive involuntary smoking and lung cancer."
Did I read that correctly?
A You read that accurately.
Q And this was in 1994, 1993/1994 article; right?
A Yes, sir.

Q Then if you turn over to page 5291, in the right-hand column, the last full paragraph. Do you see that one that starts out, "The limited reliability"?
A Yes, sir.
Q What did Drs. Wynder and Hoffmann say there? Can you read that out loud for the jury, please?
A Yes, sir. "The limited reliability of data obtained by questionnaire and the relative limited number of nonsmokers with lung cancer who were not exposed to carcinogens in occupational settings point to the need of prospective epidemiological study with exposure assessment by vital markers (e.g., cotinine and metabolites of polynuclear

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aromatic hydrocarbons and/or NNK in urine) to bring about a conclusive evaluation of the question on causality between involuntary smoking and lung cancer."

Q So Drs. Wynder and Hoffmann, it's fair to say in 1993, 1994, are still saying that it hasn't been proven conclusively that environmental tobacco smoke causes lung cancer. Would that be your interpretation

as a scientist?

A That would be my take on reading this.

MR. WAGNER: That's all the redirect I have, Your Honor, at this time.

THE COURT: All right, thank you, Mr. Wagner.

Mr. Westbrook, anything else?

MR. MOTLEY: Your Honor, can we approach one more time? I'm sorry.

(Bench discussion)

THE COURT: Mr. Westbrook.

MR. WESTBROOK: Thank you, Your Honor.

MR. WESTBROOK: May I approach the witness, Your Honor?

THE COURT: Yes.

RECROSS-EXAMINATION

BY MR. WESTBROOK:

Q Dr. Townsend, we talked about Hershey's Kisses, and they put their ingredients on the package and you had reasons why you said the tobacco industry couldn't put their ingredients on the package. You are aware, are you not, that one of your competitors, Liggett & Myers, has recently put its

ingredients on its package?

MR. WAGNER: Objection, Your Honor. It's outside the scope of proper recross.

THE COURT: Overruled.

A I had heard that Liggett & Myers had placed ingredients labeling on packaging. On cartons, actually. I don't believe it's on the package.

Q I've handed you a carton; correct?

A Right. Again, I haven't looked at their pack, but I don't think it's on there. It's just on the carton.

Q And do you have any of Reynolds' ingredients on your cartons?

A No, we don't.

There's actually some catch-alls, artificial tobacco flavors. Sounds like it's not a complete breakdown of every ingredient that's added but rather there are groups of additives. There are some specific ones here. There are also some groups as well.

Q Do you have even an incomplete listing of the ingredients of your cigarettes on your cartons?

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MR. WAGNER: Asked and answered, Your Honor. He's already answered it.
THE COURT: He's answered that.
A We do not, once again.
Q Do you have the Hoffmann article that Mr. Wagner just gave to you?
A Entitled "Smoking and Lung Cancer"?
Q Yes, sir.
A Yes, I do.
Q Turn to the last page of the text, just above the acknowledgments.
A Okay.
Q Would you read that last paragraph, sir.
A Beginning with "If we"?
Q Yes, sir.
A "If we as a nation are to lower the incidence and reduce the mortality from cancer and ascertain healthier lives for coming generations, our success will largely depend on the attention given to tobacco as a use of a major cause of human cancer."
Q I think you misread that.
A Okay. I'm sorry.
Q "Our success will depend on the attention given to tobacco use as the major cause of

lung cancer"; correct?
A Yes. You had left out the word "largely". Let me try once more from the start.
MR. WAGNER: I think it's "human cancer" also, isn't it?
Q You want to read it one more time?
A Let me try once more. Sorry. "If we as a nation are to lower the incidence and reduce the mortality from cancer and ascertain healthier lives for coming generations, our success will largely depend on the attention given to tobacco use as the major cause of human cancer."
Q Doctor --
A Did I read that accurately?
Q Sounded like you did, sir.
A Okay.
Q Mr. Wagner asked you about the list of ingredients that your company and the others submitted to Health and Human Services. Is it correct, Doctor, in your experience that before that list was submitted, that the companies removed several additives from that list before they gave the list to Health and Human Services? Are you aware of

that, sir?
A I'm not aware of a lot of details around, you know, specifics of those additives or what may have happened. I don't know.
Q Are you aware, sir, that in 1984 an employee of Lorillard's research department wrote to a Dr. Hayes at Reynolds' research department

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stating that in 1984 lawyers had thwarted the industry's scientists' desire to assure the safety of the products by testing the ingredients adequately? Are you aware that that happened?

A I'm not aware of that allegation. I'm certainly not aware that anything like that happened at Reynolds. Our scientists even back at that time, and Dr. Hayes was in charge of one of the biology sections, were evaluating additives.

Q Have you seen a memo by Alex Spears of Lorillard to Dr. Hayes of RJ Reynolds concerning the lawyers' involvement in thwarting scientists' attempts to test additives? Have you seen that memo, sir?

A No, I haven't.

MR. MOTLEY: Your Honor, we renew

our request to introduce Exhibit 30861.

MR. WAGNER: Well, Your Honor --

MR. WESTBROOK: Your Honor, may I show the witness this language?

MR. WAGNER: Wait a minute.

THE COURT: You can show him the document. It's not admitted. He can show him the document. He can read it. Do you want him to refresh his recollection here? Is that what you want to use this for?

MR. WESTBROOK: Look at the footnote, see if he's aware of the incident.

THE COURT: He can look it over.

A First of all, I don't recall seeing this document. Let me look at the footnote. I'm not aware of anything of the sort.

Q Are you aware of a group called the Committee of Counsel?

A Yes.

Q Did you know that's a group of lawyers from the major companies who met periodically?

A Yes.

Q To discuss what the industry should do about issues such as additives?

A Well, I don't know what all the Committee of

Counsel discusses. I know the Committee of Counsel meets periodically to discuss strategic issues. Certainly they've discussed a lot of more recent things lately, I think.

Q As I understand your testimony, sir, you have not seen the memo referred in this footnote?

MR. WAGNER: Excuse me, Your Honor. I'll object to questions that relate to the specific matters within the document Your Honor ruled on. I think it's outside the scope.

THE COURT: I think he was going to ask him if he's seen this document. Was that your only question?

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MR. WAGNER: He's already asked him. He didn't see it. Excuse me.
MR. WESTBROOK: I was going to ask him if he had seen the memo referred to in the footnote. That's the question, Your Honor.
THE COURT: Say your question again. Somebody was talking.
MR. WESTBROOK: My question was

going to be whether Dr. Townsend had seen the memo that is referred to in this footnote that apparently passed between Lorillard and Reynolds scientists concerning additives.
THE COURT: He can answer that question.
A You've already asked me if I was aware of that. I'm not aware of it, nor have I seen any document that refers to it.
MR. WESTBROOK: Thank you, sir. Nothing further, Your Honor.
THE COURT: I believe that's all. You've had a long day.
THE WITNESS: Long day. Thank you, Your Honor.
THE COURT: You may step down, Doctor. Thank you very much. Have a good trip.
THE WITNESS: Thank you, Your Honor.
THE COURT: Mr. Ohlemeyer, your next witness tomorrow morning will be?
MR. OHLEMEYER: We'll start with Dr. Appleton, Your Honor, tomorrow morning.

And then two other witnesses, and depending on the length of the cross, we may be able to rest our case.
THE COURT: All right. Thank you, Counselor.
Ladies and gentlemen, rather than call another witness this evening, I think we'll take the evening break.
(Standard admonition)
THE COURT: I'll see you tomorrow morning at 8:30. Good evening.
MR. CASSELL: All rise.
MR. WESTBROOK: Your Honor, may I put these back to the evidence desk?
THE COURT: Sure. Absolutely.
(The proceedings were adjourned at 5:00 p.m., to be reconvened March 13, 1998, at 8:30 a.m.)

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INDEX OF PLAINTIFFS' EXHIBITS

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